

REPORT

ON THE

BUBONIC PLAGUE IN BOMBAY

By
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CHAIRMAN OF THE PLAGUE COMMITTEE

1896-97.

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REPORT by the Plague Committee appointed under Government Resolution No. ¹²⁰⁴/_{702P.} on the Epidemic, extending from the 2nd of March till the 30th June 1897, with a short account of the preceding period.

Chapter I.

GENERAL REPORT.

Under Government Resolution No. 3045/2269-I*, dated 2nd June 1897, Brigadier-General Gatacre, C.B., D.S.O., was asked to prepare a report as regards Bombay City with special reference to the period since the constitution of the Committee of which he is Chairman.

The following is a brief description of the operations conducted by the Municipal authorities up to the time when the Committee was appointed.

August 1896
to December
1896.

Breaking out in the month of August in the Mandvi District, the plague had made comparatively little progress up to the beginning of December. That month was marked by a sudden rise in the mortality, from 130 on the 1st, to 292 on the 28th December, which spread the alarm far and wide. Up to that date there were many people who made light of the whole affair, but when the excess mortality (over the normal for the previous five years) for the first week of December was seen to be no less than 591, while the total excess mortality for the month of December was 4,559, it became evident even to these that the situation was serious.

Figures.

Perhaps one reason for the comparatively little alarm among the public of Bombay up to December may be found in the fact that the total daily mortality was not published. The plague mortality, or rather the mortality reported by the Health Department, was, it is true, given out; but it was not generally understood then how difficult it was for various reasons to get at the true figures.

Many causes contributed to this, but the chief among these were the dread entertained by all classes of the population of being removed to hospital, and the fear of having their houses invaded by a disinfecting staff. Their prejudice against hospitals was so strong that it is no exaggeration to say that most patients actually preferred to die in their houses to going to hospital, where they would have had a much better chance of recovery. Part of this repugnance was, no doubt, owing to the fact that there was only one hospital (the Municipal Hospital for infectious diseases in Arthur Road) for the accommodation of all castes and classes ; but whatever defects there may have been in the accommodation, the distrust of European methods was their main objection, founded on a baseless belief that all patients were operated on during life and their bodies given over to the dissecting room after death. Needless to say in the present case these fears were groundless ; none the less they were universally held, and had the effect of making the detection of cases extremely difficult. Another motive for concealment was the dread of having their houses disinfected and the bedding, &c., of the patient burned. At the time when the plague was at its height it was not possible to obtain high-caste coolies to carry out the necessary measures, and the measures themselves were not only considered useless by the people, but vexatious and oppressive in the extreme.

The registration system, moreover, was not equal to such an occasion. The karkoons who are stationed at the burning ghats and burial grounds for record work are obliged to be content with whatever cause of death is assigned by the funeral party, and in the case of plague, where they had these motives for concealment, the true cause of death was generally disguised. **Registration System.**

From all these causes the official statistics of the plague as compiled by the Health Department cannot be relied on. The chart given in Appendix No. 1 shows the divergence of the death-rate from the normal, and, in the absence of any other disturbing cause, most of these excess deaths must be held to have been plague deaths. But in some months the reported plague deaths are less than a third of the excess thus revealed. On the hypothesis that the excess was due to plague, we arrive at a plague mortality of 19,849 from the outbreak to the end of February, when the Committee was appointed.

From the moment of the first outbreak of the plague the efforts of the Health Officer had been directed mainly to the disinfection of the houses in which cases had occurred. Gullies were flushed down, houses lime-washed, privies and house connections attended to in the most thorough manner by the officers of the Health Department, the Drainage Engineer, and the Fire Brigade. "I am glad to be able to assure Government," wrote the Surgeon-General after his inspection of the scene of the outbreak in the first week of October, "that the utmost energy is being displayed by the Health Department of the Municipality in the infected area." **Measures taken by the Municipal Executive.**

These efforts were again recognised in the memorandum drawn up by the Medical Practitioners of the City in January and submitted by the Director-General, Indian Medical Service, to the Government of India on January 16th. On receipt of this note, the Governor-General in Council, while recommending "even stronger measures," stated that he "had learned with the greatest satisfaction of the untiring energy which has been displayed by the local authorities in the thorough and systematic cleansing and disinfection of the infected parts of the City."

M. Haffkine also, in his minute attached to the report of the Manser Committee, expressed his opinion that the measures of disinfection already being carried out by the Health Officer were in accordance with the best recognised principles of sanitation and were not in need of alteration. As to their effect, however, opinions are divided. The district of Kamatipura, which had been thoroughly cleaned before the plague attacked it, was afterwards visited by a severe outbreak, and it can readily be understood that, owing to the concealment of so many cases, it was impossible to disinfect all the infected houses, for the good reason that they could not be discovered.

As His Excellency the Governor pointed out in his letter to the Chairman of the Standing Committee of the Municipality, the very thoroughness of the process was enough to prove that the plague could not be stamped out by disinfection alone, and the attempt to enforce other methods broke down as soon as it was made.

On October 6th, the Municipal Commissioner issued a proclamation, under Section 434 of the Municipal Act, to the effect, that all cases were to be segregated, their houses disinfected, by force if necessary, and their sick to be taken to hospital; no provision, however, was made for the accommodation of different castes in different wards or hospitals. It was not explained that the relatives of the patient would be allowed to attend him, or that the prejudices of the various castes in the matter of food, &c., would be respected. Such a storm of protest, therefore, was raised by the proclamation of October the 6th that, after consultation with the Commissioner of Police, who anticipated a riot, the Municipal Commissioner modified the proclamation on the 14th of the same month, and issued a public proclamation* to this effect at the end of the month. This meant that segregation was greatly restricted.

In the absence of caste hospitals, no one would bring their sick out of their houses, and from this time, till the Plague Committee was appointed, it may be said that there was no organised effort to segregate the sick or their families.

Hospitals.

If, however, segregation had really been carried out at this period, great difficulty would have been experienced in finding the necessary accommodation for the sick; besides Arthur Road, there were no other hospitals of any sort for the reception of plague cases, and it was not

* See Appendix No. 1,

till the end of December that the Parsees established a hospital for their own community; and the Jains built another in the compound of the Arthur Road Hospital for themselves, and a private hospital for the employes of the Port Trust was opened December 23rd.

In December, His Excellency the Governor of Bombay generously offered the use of the old Government House at Parel to the Municipal Commissioner for the use of sufferers from the plague. As, however, no use was made of it, the General Officer Commanding the Bombay District offered, in the month of January, to equip and start it as a plague hospital if the Municipality would provide the funds. This was accordingly done under Government sanction, and a hospital opened there on the 18th February, equipped for 150 beds, but capable of expansion to a total of 250. Originally intended as a convalescent hospital, it was soon filled up by the overflow of patients who could not be taken in at Arthur Road, and it therefore received acute cases. It was at this time in contemplation to open a hospital at Grant Road under the direction of Dr. Dallas; but when the Committee took over plague operations, there were only two hospitals, i.e., Arthur Road and Parel. The difficulty of obtaining trained nurses was great, and but for the generous offer of the All Saints' Sisters to nurse the Arthur Road Hospital, and for the assistance given by the Military in equipping the Parel Hospital, the one would have had no nursing staff, and the other would not have been in existence. The total hospital accommodation at this time was less than 300, while approximately 900 to 1,000 plague deaths were taking place weekly.

In the meantime the European nations had been growing more and more alarmed; quarantine had been imposed at all the chief continental ports, and the state of affairs in Bombay had moved several Powers to press for "restrictive measures."

Telegram
from the Secretary of State,
January 18th.

Public attention, too, had been attracted by a passage in the Queen's Speech to Parliament, in which Her Majesty announced that she had instructed Her Government to take the most stringent measures for the eradication of plague.

Again, the Bombay Government, writing to the Government of India on February 23rd, announcing the successful introduction of the Military in the equipment of the Parel Hospital, concluded with these significant words:—

"I am to add that His Excellency the Governor in Council anticipates great indirect benefit from a measure which brings the Military into touch with the Civil Authorities in organising measures for preventing the spread of the plague, and it is not improbable that the Civil Authorities may before long be driven to seek considerable assistance at the hands of the Military."

Already Military ward orderlies had been supplied to the Municipality, and there was a general impression that Government were about to take some special steps to stamp out the disease before the rains commenced. Not much surprise, therefore, was manifested when the Government order appeared appointing the following Plague Committee for the City of Bombay :—Brigadier-General W. F. Gatacre, C.B., D.S.O., Chairman ; P. C. H. Snow, Esq., I.C.S. Barrister-at-Law (Municipal Commissioner) ; Surgeon-Major H. P. Dimmock, I.M.S., and C. C. James, Esq., A.M.I.C.E. (Municipal Engineer). Surgeon-Lieut.-Col. Weir, Executive Health Officer to the Municipality, was at once appointed as Chief Medical Officer to the Committee.

His Excellency's letter to the President of the Municipality.

Accordingly, in a letter addressed to the President of the Municipal Corporation, His Excellency the Governor of Bombay said that so thorough had been the cleansing operations carried out by the Municipal Executive that the continued existence of the plague in the City was conclusive proof that it could not be stamped out by any measures of disinfection. "Larger and different measures" were therefore needed to bring it under in a reasonable time. The first thing to be done was to search for and discover the cases, and provide hospitals for each case in convenient places, and to watch persons who were living in the same house with a sick person. The plague had spread to many places outside Bombay. To deal with it now the efforts put forth required to be far-reaching and systematic, and to aim above all things at the suppression of the epidemic before the rains. This was why Government had decided to take the management of the epidemic into its own hands, to systematise and direct the efforts of individuals and bodies, and prevent dissipation of energy. No slur was intended on local administration or self-government ; the appointment of the Committee was "an Imperial necessity" which should meet with the support of all the citizens of Bombay. On the same day the following letter was addressed to Brigadier-General Gatacre by His Excellency the Governor :—

DEAR GENERAL GATACRE,

It is desirable that I should supplement the Notification appointing your Committee by some definite written instructions as to the course of action that you should take. This Notification empowers you to carry out the measures to be taken to suppress and prevent the spread of bubonic plague. These measures should comprise an organisation for—

1. The discovery of all cases of plague.
2. The treatment of all cases in hospitals.
3. The gradual segregation, as far as possible, of the probably affected—that is, of those living in the same room with, or in close attendance on, a person who is found to have the plague.

These are the objects to the attainment of which your energies should be directed. I am sure I need not do more than indicate that in all cases of obstinacy or misunderstanding on the part of those whom it is our endeavour to benefit, persuasion and gentleness should be used ; that the privacy of women should be disturbed as little as possible, and only by women ; and that the caste and religious usages of the people should be treated with all consideration.

It is essential that the hospitals should, as far as possible and practicable, be open to the friends and relatives of the patients, who should be, as far as possible, accommodated near them and encouraged to come and see for themselves that the patients are well cared for.

Everything that can be done is to be done to avoid creating a feeling of distrust, and I hope that those employed under you will, by combining persuasion and explanation with firmness, avoid this evil. Every advantage should also be taken of the services of natives of influence. Many influential gentlemen of the various communities, most of whom are Justices of the Peace, have offered their services, and I have great confidence that the assistance they will render you will be really beneficial.

In carrying out these measures, you will have at your disposal the whole staff already employed in plague operations in the City of Bombay. You are empowered to add to their number and to arrange and organise them in what you consider to be the most effective way.—I am, &c.,

SANDHURST.

The Notification appointing the Committee was made under the Epidemic Diseases Act, III of 1897, the last four Sections run as follows :—

1. The Committee are invested with all the powers conferred on, or vested in, the Municipal Commissioner of Bombay by Sections (relating to the exceptional powers which the Commissioner can assume on the outbreak of an epidemic) of the Municipal Act, and by the Notification of the Commissioner, dated October 6th, 1896, Sections 422, 423, 424, 425, 426, 427, and 429, and by the Notification No. 228-P of the Governor of Bombay in Council, dated February 10th 1897, and the Committee are empowered to take any of the measures authorised by the said Sections and Notifications.
2. The Municipal Corporation of the City of Bombay and all the officers and servants of the Corporation, and all public servants and all persons employed by the Committee shall carry into effect, without delay, any measures which may be ordered by the Committee.
3. All expenses incurred in carrying out such measures shall, in the first instance, be paid out of the Municipal Fund of the City of Bombay; but the Municipal Commissioner or the Corporation may recover from any person any amount which such person would, under similar circumstances, be liable to pay to the Municipal Commissioner or the Corporation under the City of Bombay Municipal Act, 1888.
4. On the requisition of the Committee, the Commissioner of Police shall give such assistance as may be necessary to enforce immediate compliance with any order of the Committee.

The action of Government was generally approved ; one paper remarked with apprehension, that " a Brigadier-General sitting in the chair has an uncomfortable appearance of something like a resort to martial law," and some of the few members of the Corporation who were still in Bombay entered a sort of protest against the appointment, " in which," as one member observed, " the very existence, position, and life of the Corporation were involved."

*** Staff.**
 Ind. Lieut. A. J.
 Thompson, R.A.
 Lieut. G. Warneford,
 44th Gurkhas.
 T.J. Strangman, Esq.,
 Barrister-at-Law.

On the 2nd of March the Committee appointed Major W. F. Cahusac, D.A.A.G., Bombay District, to be Secretary to the Committee, and formed a small staff of such officers and others as were available in Bombay.* The office was located on Malabar Hill in the house of the Chairman, conveniently situated for the members of the Committee.

**Organisation
 and Disposition
 of Medical Officers.**

The first step taken by the Committee was the division of the City into ten districts, due regard being observed to density of population and number of houses, the Census districts of the City being taken as a foundation. Each of these districts was placed in charge of a responsible Medical Officer. Some delay was experienced in obtaining the services of Commissioned Medical Officers, but the following—

Surg.-Lt.-Col. H. HAMILTON, I.M.S.,
 Surg.-Major H. E. DEANE, A.M.S.,
 „ J. C. CULLING, A.M.S.,
 Surg.-Capt. J. E. BROGDEN, A.M.S.,
 Surg.-Lt. H. A. L. HOWELL, A.M.S.,
 „ C. K. MORGAN, A.M.S.,
 Surgeon R. S. BERNARD, R.N.,

were finally detailed for plague duty, and placed under the orders of the Committee. No. 10 district, comprising the northern half of the island, was placed in charge of Surgeon-Captain Jennings, I.M.S., who had been appointed Extra Health Officer of Bombay in December 1896, on being relieved of his duties as Acting Health Officer of the Port. Messrs. Britto and Shroff, Local Practitioners, and Assistant Surgeon Pettigrew were also placed in charge of districts. By the Notification already quoted, all the Municipal servants had been placed at the disposal of the Committee. The Inspectors and the Disinfecting Staff already working under the Health Department were thenceforward directed by the District Medical Officers, the same plan being adopted with regard to the extra men working under the Drainage Department. It was, however, found necessary to largely add to the number of the men engaged in lime-washing infected houses. They were assisted in their work by Sub-Divisional Medical Officers drawn from the Native Medical Practitioners of the City.

Plan No. 1 attached to this report shows the districts, each in a distinctive colour, and in the margin a reference square of the same tint gives the name of the District Medical Officer, with those of the Census districts and the population of each with the number of houses.

The same plan shows by a yellow circle, with a number in it, the position of the 15 Government hospitals as per list printed on plan. The position of these hospitals was fixed with a due regard to districts and population.

The private caste hospitals are shown by red squares with a number in each, which corresponds with the index given on the plan, which also gives the name of the caste or community to whom the hospital belongs.

All these districts and hospitals were brought into operation as soon as possible, and they all remained in force until the plague had declined sufficiently in May to allow of the Committee reducing the hospitals and the staff. At the same time some of the districts were amalgamated, but the original disposition of the City has been faithfully kept up to the last.

In Appendix No. II will be found a list of district staff detailed for the several districts, which was made as complete as possible to enable it to cope with any difficulty.

The following duties were laid down for the Medical Officers and Nurses working under the Committee :—

1. To superintend and exercise sanitary supervision of the whole district in their charge, reporting to the Plague Committee and Health Officer daily. **Instructions for Medical Officers.**

2. To supervise the working of the district hospitals and to attend the same in routine.

3. To supervise the work of the search parties in conjunction with the Justices of the Peace.

4. To control the disinfection of the infected areas and buildings.

5. To inspect all segregation camps in their districts.

6. To call the attention at once of the Officer appointed by Government for the condemnation of insanitary buildings to any such premises in their districts.

7. To report on registration of burials and cremations in their districts, and to supervise sanitary condition of cemeteries.

8. To send daily reports to the Plague Committee and Health Officer of casualties occurring during 24 hours preceding 6 a.m., with details of—

(a) what has transpired during the preceding 24 hours in their districts ;

(b) any suggestions they have to offer.

**Instructions
for Nurses un-
der the Plague
Committee.**

1. Nurses are engaged by the Plague Committee for the particular purpose of nursing at the Special Plague Hospitals.

2. The Reverend Mother Superior, All Saints' Sisters, Mazagon, has kindly undertaken the duties of general supervision of the Nurses, and they are therefore ordered to comply with her instructions. For all purposes of Hospital nursing and discipline, the Nurses will be under the orders of the Officer in charge of the Hospital or of the District Medical Officer.

3. The Reverend Mother has authority to transfer and change Nurses according to the requirements of the various Plague and General Hospitals, but intimation should, if possible, be given to the Medical Officer of the District or Hospital.

4. Nurses will be engaged by the month, and the pay will be as follows :—

Matrons—Rs. 150 per mensem, with quarters, food, lights, and all found.

Senior Nurses—Rs. 100 per mensem, with quarters, food, lights, &c., all found.

Junior Nurses—Rs. 80 per mensem, with quarters, food, lights, &c., all found.

Subordinate Nurses—Rs. 20 to Rs. 30 per mensem, with quarters, food, light, &c., all found.

5. When food is not provided, a board allowance of Rs. 1-8-0 per diem will be allowed for Europeans, and As. 8 per diem for Natives.

6. In the case of Nurses engaged from England on Rs. 175 per mensem, board allowance at the rate of Rs. 1-8-0 per diem will be deducted from their pay.

7. The duties of Matrons and Senior Nurses will be as follows :—

The management of servants, providing meals and general care of Nurses' messes. All Ward arrangements to be under their supervision. The cleansing of Wards, latrines of hospitals, &c., the disinfection of clothes, and entire control over Nurses, Ayabs, and Ward Boys ; also the disbursement of all petty cash.

8. The duties of Junior and Subordinate Nurses will be as follows :—

To assist the Matron generally ; to be responsible during her temporary absence ; to go round with the Doctors ; to receive orders and to see that the orders are carried out.

9. All Nurses are requested to carefully attend to the directions given for general precautions for troops and others employed on Plague work.

General Precautions for Troops and others employed on Plague Work.

To be segregated in a suitable camp.

Clothes to be changed on return from plague duty ; the suit that has been worn to be hung up in the sun.

Daily inspection of working parties by a Medical Officer ; those shewing signs of fever or debility to be struck off work.

Hands and face to be inspected for abrasions.

A good breakfast to be supplied before starting work.

Arrangements should be made to provide a mid-day meal in cases where the men cannot return to camp for this meal.

Putties should be worn to prevent the dust from infected houses coming in contact with the legs.

It should be impressed on the men that a fruitful mode of infection is through abrasions on the skin, and all such should be reported at once to the Medical Officer.

A supply of carbolic lotion, 1 in 40, should be sent with each search, limewashing, and demolition party ; and after work the men's hands should be bathed in this preparation.

Disinfectants should be freely used in the camp.

The limewashing and disinfecting parties should be warned not to enter an infected house before at least some preliminary disinfection has been carried out.

A bath, with some phenyle in it, on return from work is desirable. Sea-bathing to be encouraged.

Drinking-water and milk to be boiled before use.

The wearing of thick gloves by the limewashing and demolition parties would be a useful precaution.*

When a sick person is found suffering from plague, the stretcher should in each case be taken *up to the room*,† the patient lifted carefully on to it and kept strictly in the horizontal position.

Two blankets should be taken with each litter.

Stimulants for the sick to be arranged for by the Medical Officer in charge of search-parties.

* Not found necessary.

† Often impracticable on account of steepness and narrowness of staircases.

WARD ATTENDANTS ON THE SICK.

Each attendant will be furnished with two suits of ward clothes.

A suit will be put on before going on duty.

On coming off duty, the suit will be soaked in a disinfectant (carbolic 5 per cent. or perchloride of mercury lotion) and dried in the sun.

All the clothing of men about to rejoin their regiments should be disinfected before they leave the hospital compound.

PATIENTS.

A patient on admission will be undressed and well washed with hot water and carbolic soap. Hospital clothing will be supplied.

All articles not worth preserving will be at once burned under the supervision of some responsible person.

There being no steam disinfecter available, clothing of any value should, if of cotton, be boiled for three hours in a 3 per cent. solution of soft soap in water, or steeped in perchloride of mercury solution before being washed.

Woollen clothes worn by the patient should be burned.

WARDS.

The boarded floors should be swabbed twice daily with perchloride of mercury solution.

The whole of the stone floors will be whitewashed with freshly made limewash at least once a week.

Should any discharge from a patient fall on the floor, it must be at once covered with carbolic powder and swept up. Perchloride of mercury solution should then be applied to the spot, and fresh whitewash applied to the stone floor.

Crockery and glassware should be washed in a 5 per cent. solution of carbolic acid before it is allowed to leave the ward.

Beds will be linewashed after a patient's recovery or death, the straw burned, and the bedding disinfected.

EXCRETA.

A small quantity of some disinfectant, such as carbolic powder, lime water, perchloride of mercury solution, or chloride of zinc solution should be placed in each bed-pan before use. After use, the motion should be covered with a similar disinfectant before being taken out of the ward.

The solid excreta will be destroyed in the incinerator.

After use, the bed-pans should be scalded with hot water.

CORPSES

Will be wrapped in a sheet soaked in perchloride of mercury solution before being handed over to friends. The sheet must be burned, or buried with the body.

HOSPITALS.

It has already been mentioned that up to the 6th of February there were no Nurses in the only existing Plague Hospital. When this became generally known, the wants of the Arthur Road Hospital were at once met by the offer of the All Saints' Sisters, who volunteered their services, which were most gratefully accepted. With the opening of a number of new hospitals, however, as the Plague Committee contemplated, it was found impossible to procure sufficient Nurses in this country. It was admitted that in dealing with Plague, for which no unfailing or even moderately successful treatment had yet been found, nursing and feeding by trained Nurses was the most essential element in success, and it was believed that the presence and the attendance of Nurses would go far to remove the terror felt by the natives at finding themselves in hospital; one of the first steps taken, therefore, by the Committee was to telegraph to England for 12 additional Nurses.

As a first step, the Sisters of the Bandora Convent were put in charge of the Hospitals at Mahim, Sion, Bandora and Parel Government House. The Sisters from Claro Road Convent took charge of Grant Road, while the Mazagon Sisters nursed the Arthur Road Hospital; the services rendered by these Nurses, one of whom—Sister Elizabeth (Fille de la Croix)—succumbed at her post, will not be lightly forgotten by the public of Bombay.

These preliminary arrangements having been completed, the next step was to provide Hospitals in sufficient numbers to accommodate the sick. Eighteen was the number at first suggested, and in the case of private Hospitals many persons came forward readily with offers of buildings, and money to equip them. The Staff, *i.e.*, medical men and attendants for every private Hospital, were provided by the people of the caste themselves. The situations, &c., and the dates of the opening of the various Hospitals are given in the following table. Eighteen were completed by the end of March:—

District No.	District Hospital.	Date of opening.	Sections.
1	Pilot Bunder G.	10-3-97.	Upper Colaba.
	Jamsetjee Bunder G.	1-4-97.	Lower Colaba.
2	Modi Khana G.	31-3-97.	Fort, North.
3	Modi Khana for Sahebs' Servants... P.		Esplanade.
	De Souza Street, for Lohana Cutch, Halari Gogjari community. P.	1-4-97	Mandvi.
	Mint Road by Govindji Thakersi Mulji for Bhattias. P.	18-3-97.	Esplanade.

Note.—G stands for Government and P for Private.

District No.	District Hospital.		Date of opening.	Sections.
3	Jackaria Masjid Street, for Cutchi Memons.	P.	29-3-97.	Oomerkhadi.
	Olive Road for Dussa Sa Bannias ...	P.	17-3-97.	Dongri.
	Memon Moholla Street, for Halli Memons.	P.	18-4-97.	Oomerkhadi.
	Kolsa Street by Haji Cassum Mitha for Memon Sunnis.	P.	1-4-97.	Chakla.
	Imambara, by Aga Abdul Hussein for Mogals.	P.	15-3-97.	Oomerkhadi.
	Tantanpura Street, Khoja Hospital.	P.	28-3-97.	"
	Nagdevi Street, General Mahomedan community.	P.	15-4-97.	Chakla.
	Chattri Sarang Street Hospital for Kocani Sunnis.	P.	25-3-97.	Oomerkhadi.
	Grant Road	G.	4-3-97.	Kamatipura.
4	Bhuleshwar, for Marjadi Vishva Bunnia community.	P.	1-5-97.	Bhuleshwar.
	Pinjrapol for Marwaris	P.	1-4-97.	"
	Nizampara, Bapu Hajan Street, Bhendi Bazaar, for Kocani Sunnis.	P.	25-3-97.	"
	Bapu Khote Street, for Kattri Mahomedans.	P.	1-4-97.	"
	Gol Pitha, Falkland Road, for general Mahomedan community.	P.	7-5-97.	2nd Nagpada.
	Haji Cassum Jossab Hospital, Bangari Moholla.	P.	8-4-97.	Market.
5	Charni Road Hospital	G.	25-3-97.	Chaupati.
	Charni Road Hospital, one ward provided by Chubildas Lalobhoy for Bhangsali caste.	P.	20-3-97.	"
	Charni Road by Adamjee Peerbhoy for Borah community.	P.	19-3-97.	"
6	Telaga for community	P.	14-4-97.	"
7	No Hospital.			
8	Arthur Road Hospital	G.		Khetwadi.
	Foras Road, Police Hospital ...	G.	24-3-97.	Tardeo.
	Ripon Road, Julai Hospital ...	G.	10-4-97.	Byeulla.
	Futtehali's Hospital for Borah Suliman community.	P.		"
	Paral Road, Parsi Hospital ...	P.		"
	Arthur Road, Jain Hospital ...	P.	30-3-97.	"
	Paral Road, Jain Hospital ...	P.	1-4-97.	"

Note.—G stands for Government and P for Private.

District No.	District Hospital.		Date of opening.	Sections.
9	Wari Bunder	G.	26-8-97.	Masagon.
	Nariel Wady	G.	25-4-97.	"
	Reay Road	G.	1-4-97.	"
	Port Trust Hospital... ..	P.	28-12-96.	"
	Connaught Road, Hindu Hospital...	P.	12-8-97.	Tarwadi.
	Connaught Road, Khoja Hospital ...	P.	26-4-97	"
10	Parel Government House	G.	18-2-97.	Parel.
	Sion	G.	23-8-97.	Sion.
	Mahim	G.	27-8-97.	Mahim.
	Worli	G.	*1-4-97.	Worli.
	Dharavi, Borah community	P.	4-4-97.	Mahim.

Note.—G stands for Government and P for Private.

* In the case of the Mahomedan community, and particularly of the Kocani Sunnis, much difficulty was at first experienced in bringing them to reason. The *non-possumus* attitude which they at first adopted is well illustrated by the proceedings at a meeting called by Hadji Oomer Jamal on December 28th for the purpose of persuading the community to assent to segregation. Most of the speakers were in favour of prayer as the best way of averting the disease, and when the promoters of the meeting tentatively suggested segregation, an old Mahomedan gentleman, as spokesman for certain sections of the community, said, "he might mention that they were totally opposed to segregation and that nothing would persuade them to send their plague-stricken to the Municipal Hospital." A young Mahomedan then arose and, in supporting the last speaker, remarked: "We will not go to Hospital. Our Musjid is our Hospital." And this sentiment seemed to find favour with the meeting. —(*Times of India*, December 29th.)

Mahomedan feeling on segregation.

As regards the Hospitals themselves, any and every objection was put forward against them. The same Kazi who is mentioned below as having an interest in the burial-grounds said in the course of an inflammatory speech on March 13th: "The vehicle employed to convey plague patients to the Hospital was regarded as a hearse brought to the door of one's house to take away the dead. Mothers whose ill and suffering children were taken away from them would become frantic and sacrifice their lives; men's frenzy would turn them into fanatics; they would lose control over themselves. How could a husband be expected to tolerate the sight of his wife's hand being in the hand of another man? From the vans or carriages for the sick, patients were taken out and thrown down upon the floor of the Hospital as if they were so many pieces of stone. Moreover, in the Hospital one could not say his prayers so many times a day; one would be made to drink spirits." The last argument of all was one urged by a street orator, who insisted that segregation was contrary to the principles of Islam.

Till the Committee were appointed, there were no ambulances for the conveyance of the sick to hospital. The only provision for this purpose consisted of three vans constructed for the Health Department some years ago, which are referred to in the speech of the Kazi quoted above.

Municipal vans.

**Motives for
his attitude.**

One reason for this obstinacy on the part of the Mahomedans was undoubtedly that they had suffered less in proportion from the epidemic than the Hindus, though fewer had left the City. Another explanation of the resistance made, and one which accounts for a great deal of their opposition, was, that it was well known that one of the steps which the Committee had resolved upon was the closing of the Grant Road Cemetery which was terribly overcrowded. This meant the loss of a large sum of money to the Kazi Meheri and some of his relations in fees; and either in revenge, or with the design of obtaining the support of the community on this point, the Kazi put himself forward as the champion of the Mussulman community in the matter of segregation. Interested persons spread many false and malicious reports as to the treatment of patients in Hospitals which fell upon favourable soil. Finally, the Chairman of the Committee addressed a general meeting of the Anjuman-i-Islam, assembled by the Hon'ble Mr. Justice Tyabji, and explained to them once for all that the orders of Government on the subject would be unflinchingly carried out, whatever might be the consequences, and at the same time dispelled the notion which some mischief-makers had put into their heads, that the preventive measures which the Committee were taking were opposed to the spirit or practice of the Mahomedan religion. The address, very ably interpreted by Mr. Tyabji, was well received. For some time previously frequent house-to-house searches had been carried out in the parts of the City in which most of the turbulent classes of Mahomedans live. These searches were supported by the presence of troops—a silent argument which had a convincing effect on the minds of the men who till then had been breathing fire and resistance to Government. These searches were accompanied by the Justices of the Peace, who lived in the localities, whose presence gave support to the search parties and reassured the people that nothing contrary to their religion or needlessly offensive to their prejudices was intended. These good citizens had come forward on the invitation of His Excellency the Governor a short time previously, to offer their help in searching, and the Committee availed themselves of their services by organising a system under which the Justices could work by themselves. A certain District was allotted to each Justice and a small guard of Military sepoy was provided as escort.

The following proclamation was at the same time published in the Press, and distributed broad-cast through the City :—

**BATAKI ON THE SUBJECT OF HOUSE-TO-HOUSE VISITATION ISSUED
BY THE PLAGUE COMMITTEE.**

"Be it known to all concerned that Government, in its anxious concern for the well-being of the inhabitants of Bombay and for the complete extinction of the plague now prevailing in your homes, have decided that, in accordance with the opinion of many doctors and hakims, it is necessary to remove all persons suffering from plague from their houses for a short time and to treat them in hospitals, public or private. Fur-

ther that where a sick man has been taken away from a room, his family shall also vacate such room and shall take care of and tend the sick man, so as to enable the room to be cleaned by the Municipality. Be it well known that where a private hospital has been established in a *jamat*, all cases of plague in men, women, or children shall be taken thither, or, where no *jamat* hospital exists, to one of the hospitals of Government, where in the hands of God and the Nursing Sisters the patient may be cured.

“Be it known that, while such persons are being treated in any hospital, either public or private, all expenses for food, medicine, and clothes shall be borne in the case of Government hospital by Government, and in a private hospital by the leading men of the *jamat*.

“That further it is only those sick with the plague or small-pox who shall be taken to hospital, and that those suffering from any other cause shall be treated in their own homes by their own doctors (*hakims*). That in every house which is searched in which *purdah*-women are living, the *purdah*-women shall be visited and inspected by lady doctors only, and shall, when removed to hospital, be taken in a covered conveyance in charge of a lady doctor, who shall place them in a *purdah* hospital, where they shall be treated by women only.

“*That all contrary statements to the above decrees are lying misrepresentations of the truth, published by designing persons to forward their own ends.* Let all such persons take warning that Government will view with displeasure and disfavour all such persons as seek to mislead and do mischief to the ignorant, for these readily believe the word of their superiors, who can either do much harm by their bad advice or much good by wise counsels.

“That the Committee approved by Government to stamp out the epidemic will at all times be ready and pleased to assist with their advice such as come to them for it, and with money, those who cannot afford to pay expenses which the plague has cast upon them.”

Although the number of the Justices was very largely increased by the free issue of Special Constables' certificates to suitable applicants, the total of men employed on this duty was so small that to properly search a city of the size of Bombay they had to be continually at work, and much excellent service was done by these gentlemen; the mere moral effect of their associating themselves openly with the measures taken to stamp out the plague was of great value in convincing the masses of their poorer caste-fellows of the good faith of Government in the matter. Not only was the work of visiting houses in itself laborious and unpleasant to them, but the Native Justices had also to face the ridicule, and in some cases odium, of their castemen in return for their unselfish labours.

AID AFFORDED BY THE MILITARY.

Owing to the terrifying effect the heavy mortality from plague produced on the lower classes of natives in Bombay, it was almost impossible to procure servants of any description to serve in plague hospitals; and when procured, tempted by the high rates of wages offered, their stay was most uncertain. It constantly happened that men joining the hospital for duty only remained for a few hours. The constant change in menial staff thus caused gave much extra trouble to the Medical Officers concerned, and was most detrimental to the well-being of the patients. With the sanction of His Excellency Lieut.-Genl. Sir Charles Nairne, K.C.B., Commanding the Forces, Bombay, the services of troops in the Bombay District, both British and Native, were placed at the disposal of the Bombay Government, and, in response to the call for volunteers, officers and men sent in their names *en masse*. Henceforward wherever and whenever in the Presidency assistance was required to assist in house visitation, to work as required in the hospitals as clerks, storekeepers, ward masters, dressers, cooks, orderlies, or to draw the spring ambulances, parties of sepoys were detailed for these purposes and placed on permanent duty in the district in which their work lay.

They were clothed in a working dress of blue drill with putties, wore no side arms, and, except in the case of large detachments detached to distant points in No. 10 District, they left their rifles in regimental charge. Both the European soldiers and sepoys employed on plague duty were segregated, tents or huts being provided for them close to their work. A cot was given to each man to keep him off the ground, and the following scale of pay was passed as remuneration for the extra work done:—

Rates of Plague Pay and other Allowances—						Rs. a. p.		
British Non-Commissioned Officers	...	...	...	...	...	1	0	0 per day.
Extra ration money	...	...	...	...	...	0	6	0 "
British rank and file	...	...	...	...	...	0	12	0 "
Extra ration money (unless food is provided)	...	...	...	...	...	0	6	0 "

Native Ranks—

Subadars	...	...	...	...	...	1	8	0 "
Jamadars	...	...	...	...	...	1	0	0 "
Non-Commissioned Officers	...	...	...	...	...	0	12	0 "
Sepoys	...	...	...	...	...	0	8	0 "

The ration money to be expended in food daily, and not given to the men.

2 suits of cheap khaki or blue drill.

A puggr (Native Infantry).

Rupee one *per month* for wear of boots.

1 mattress, straw filled

1 blanket.

1 sheet.

1 pillow case.

1 cot per man for British and Native troops.

for British Troops. } Can be regimental and thoroughly disinfected with perchloride of mercury before returning to barracks.

On the decline of the plague in June 1897, this scale was modified and a reduction effected in the pay of each grade.

The work was hard and exceedingly trying at times, and the remuneration offered was much appreciated. Owing to the precautions

taken as to segregation and disinfection, but few casualties from plague occurred amongst the troops, though 11 deaths from this disease were recorded amongst the sepoy employed.

It is gratifying to note the extreme cordiality that existed throughout the whole period during which the troops were employed, between the Military on duty and the Civil population. Every kindness, consideration, and civility were shown to the people by the men; this was thoroughly appreciated, and the result was the entire absence of complaint; no difficulty was experienced by European soldiers or sepoy employed in searching or on disinfection duty.

It is also due to the Officers and Native Officers in charge of detachments to say that great care was taken by them to enquire into any minor dispute or misunderstanding brought to light; and liberality was displayed by them on all occasions.

The total number of troops employed was—

<i>British.</i>			<i>Native.</i>			
B. O.	N. C. O.	Men.	B. O.	N. O.	N. C. O.	Men.
3	6	20	4	11	29	537

It will be observed that but comparatively few European soldiers were employed, and these, with the exception of fourteen men in the Colaba ward, were engaged in overseer and inspecting work. The reason of this was, *first*, that the European garrison of Bombay is small and is very fully occupied with guard and other duties, and, *secondly*, that in work which takes the British soldier into Native houses there is always a risk, owing to his absolute ignorance, in most cases, of the language and habits of natives, of a misunderstanding arising which may lead to serious offence being given where none is intended.

It is obviously impossible for British Officers to be responsible for a large number of small detachments of three or four men scattered over a town in house visitation or disinfection, and Justices of the Peace work more freely and happily with men of their own race than with European soldiers.

In all there were 3 attacks amongst British troops in Bombay with no deaths; but the Native troops lost 11 men out of 14 cases reported.

It must be observed that every reasonable precaution was taken to ensure against infection; the strictest sanitary *régime* was enforced amongst all soldiers, British and Native, in the garrison, whether employed on plague duty or not; the Native town was placed out of bounds; the whole of the Native portion of the force, whose lines are in close proximity to the city, was put under canvas; all regimental followers were placed in *chappar* huts at Colaba; and a strict daily medical supervision was kept over troops and barracks during the epidemic; the families belonging to the Native Infantry Regiments were sent to their homes and no case of plague was reported amongst them.

Chapter II

HOSPITALS.

An important basis of the operations for the eradication of plague in the City of Bombay was the establishment of temporary hospitals to which plague cases could be sent; and concurrently with the many details of the organisation, and the division of the City into districts and sub-divisions, sites for such hospitals were selected to meet the needs of each of the ten districts.

The aims of the Committee were directed to procure such situations for the hospitals that the removal of patients to them from any part of a district should not involve too great a distance, to add the fatigue of transport *to the dangers of the disease*; that the patients should be placed under every possible advantage of modern skill and knowledge, and that the position of the hospitals should ensure air, healthy surroundings, convenience of water-supply, and other important hospital and sanitary details, while giving every consideration to the health and sentiments of the people in the neighbourhood.

The Committee, in determining on this line of action, took into consideration the existing hospitals which were especially devoted to plague purposes—the Arthur Road (Municipal) Hospital, the Government House Parel Hospital, and the Grant Road (Municipal) Hospital. The three latter were set apart for special purposes in the districts in which they were situated and will be referred to in detail. In some of the larger districts it was found necessary to erect a hospital in each sub-division to meet requirements; for instance, in No. 9 District three temporary hospitals were put up, and in No. 10 there were also three temporary hospitals, besides the Parel Government House Hospital. The selection of sites commenced from the Colaba end of the Island, Colaba being named No. 1 District. In the Sub-division of Upper Colaba * a temporary Plague Hospital at Pilot Bunder was already being worked by the Military Authorities; this was taken over by the Committee and several improvements effected in its equipment. In Lower Colaba another site was selected and finally obtained from the Port Trustees on the Jamsetjee Bunder, and here Government Hospital No. 2 was erected. It was surmised that these two hospitals would be equal to the hospital requirements of No. 1 District, and the result justified this forecast.

* Upper Colaba being the southern portion of Colaba.

In No. 2 District, which included sub-divisions of Fort South, Fort North, and Esplanade, a site was selected at Mody Khana, also on Port Trust ground, and the erection of Government Hospital No. 3 on it was ordered for the reception of all patients from No. 2 District and also for cases occurring amongst the shipping and country craft. In this district were also situated the Sahebs' Servants' Hospital (instituted by Professor Müller and Brigade-Surgeon-Lieutenant-Colonel Barker) and the St. George's Temporary Plague Hospital, both of which had already rendered excellent service to the public during the epidemic.

No. 3 District included Mandvi, Dongri, Chakla, and Omerkhadi; a difficulty was found in obtaining a site for a hospital here, and the Port Trustees being unable to place a godown at the disposal of the Committee for the purpose, Government Hospital No. 5 was not established; patients from No. 3 District were eventually sent to Government Hospitals Nos. 3 and 8.

No. 4 District. No convenient site could be found in the crowded area of No. 4 District, containing Market, Bhuleshwar, Khara Talao, and Kumbharwada, and it was decided that, owing to want of space and possible popular prejudice against a plague hospital, this district should work to No. 4 Government Hospital, which was enlarged to meet the requirements of both districts.

No. 5 District comprised Chaupatti, Girgaum, Fanaswadi, and Dhobi Talao. A site for Government Hospital No. 4 was selected in the Charni Road Gardens on the Kennedy Sea Face; permission being granted by Government, by whose orders the gardens were closed to the public.

No. 6 District, consisting of Kamatipdra and 1st and 2nd Nagpada, was already supplied with a hospital, viz., Grant Road (Municipal) Hospital No. 6. Its equipment was completed with the utmost despatch, and quarters for the staff were built in the Northbrook Gardens, which were placed at the disposal of the Committee by the Municipal Commissioner and closed by him to the public. This hospital proved of the greatest service in receiving all cases from No. 6 District and surplus cases from the surrounding districts, as it was centrally situated for District Nos. 3, 4, 5, 7, 8, and 9.

No. 7 District, comprised Walkeshwar and Mahalakshmi; a convenient site could not be found here, although several were selected. It was finally arranged that this district should work to Government Hospitals No. 4 (Charni Road), No. 6 (Grant Road), and No. 14 (Arthur Road).

No. 8 District included Khetwadi, Tardeo, and Byculla, in which was situated the permanent Municipal Hospital, i.e., Arthur Road,

and to which cases up to date had been sent from all parts of the City. To diminish overcrowding the Committee ordered that only Byculla and part of Mahalakshmi sub-divisions should work to the Arthur Road Hospital, Tardeo and Khetwadi working to the Grant Road Hospital No. 6.

At the urgent request of the Commissioner of Police, the Committee erected a Special Plague Hospital for the Police force capable of accommodating sixty beds. The site selected was on an enclosed space belonging to the Municipality used for the storage of road metal near the Foras Road Market in the Tardeo Sub-division of No. 8 District.

No. 9 District was composed of Tarwadi and Mazgaon sub-division districts which had suffered most severely. Three temporary hospitals were allotted, i.e., one on the Reay Road, near Frere Bunder, a second at Nafielwadi, and for a third the Port Trust Chairman was asked to allow the Plague Committee the use of the Port Trust Hospital at Wari Bunder, extension being made for the needs of the outside public. As, however, this hospital had been designed to meet the requirements of the Port Trust employes only, the proposal was not accepted, but permission was given to the Committee to erect a hospital of their own on the vacant space adjoining the Port Trust Hospital; and here the Wari Bunder Government Hospital No. 8 was built. Three private hospitals—the Parsee (No. 19), the Hindu (No. 23), and the Khoja (No. 24) hospitals—were already in good working order in this district.

No. 10 District was an extensive one and included Parel, Sewri, Worli, Sion, and Mahim. The Government House Parel Government Hospital No. 15 was already in working order, and it had been decided that it should be utilised for the purposes of a hospital for the Parel, Sewree, and southern portion of the Sion Sub-division, for convalescents from all other hospitals in the urban area, and as a training school for Nurses and Ward Orderlies—British and Native. To this hospital also were attached for instruction all Medical Officers and Subordinate Medical Officers joining for duty under the Plague Committee. A site for Government Hospital No. 16 was fixed on at Sion Koliwada on ground belonging to Mr. Harkisandas Narotamdas, who readily gave permission for its use. Plague cases and suspects from the Sion Causeway, G. I. P. Railway, and Sion District were treated in this hospital. In this sub-division a private hospital was sanctioned for the people of Dharavi village who are principally tanners, amongst whom plague was severe; the cost of erection and maintenance of the hospital was borne by the owners of the Tanneries.

The site for Government Hospital No. 17 was chosen on the foreshore near the Mahim Causeway, and the Police Superintendent's house close by, having been vacated, was given as quarters for the

Nurses by the Commissioner of Police. Cases coming to this hospital were principally from Mahim Causeway Road Inspection, B. B. & C. I. Railway, and the Mahim District.

The site for Government Hospital No. 18 was selected at Worli on Cleveland Bunder, which was placed at the disposal of the Committee by the Trustees of that property. This hospital met the wants of the Koli fishermen and of the Worli District, where the epidemic had been very severe.

At Bandora a special hospital was erected for the people employed at the slaughter-houses, where there had been a serious outbreak of the disease. The arrangements for the building of this hospital, maintaining it, and overcoming the dislike of the butchers to hospital *regime* were placed in the hands of Veterinary-Major Mills, J.P., Principal of the Veterinary College, Parel, who was granted the special powers of 1st Class Magistrate by Government for this purpose.

DETAILED CONSTRUCTION OF HOSPITALS.

A scheme of hospital organization was prepared and a standard plan of hospitals was designed, a special equipment of staff, stores, furniture, and appliances being drawn up on a ready basis, suitable to any pressing demands.

In designing the hospital, a section was taken as the unit; this held 20 beds in an area of 120' x 24', giving each bed a superficial area of 144 square feet, a somewhat liberal provision; but bearing in mind the necessity for attendance of one or two relatives with the patient, and looking to the fact that a large cubic space of fresh air favorably influences the progress of recovery and lessens the possibility of contagion, it was determined by the Committee to adhere to the above measurements. * Subsequently it was found convenient to build half-section hospitals (10 beds) and quarter section hospitals (5 beds) in districts where few cases were anticipated.

The standard adhered to, however, was that of a one-section hospital, and to it was apportioned its standard equipment, so that on an order being issued by the Committee for the institution of a hospital of any proportion, the District Medical Officer had merely to follow the orders laid down on the subject for a hospital of the size indicated. This saved much delay in ordering staff, stores, &c., for any hospital, more especially at outlying stations. Copies of the plan and equipment of a one-section hospital were accordingly issued to the various executive departments of the Committee, and to all contractors, with directions to regulate the construction of buildings and the supply of stores, medicines, and furniture accordingly.

As will be noticed by referring to Plan No. 4 attached to the Appendices of this Report, the hospital was enclosed in a ring fence constructed of bamboo matting fixed on bamboo uprights.

The Plan No. 4 shows a one-section hospital and is designed to fit into the smallest area possible, viz., 140' x 160', but wherever more room was available, advantage was taken to spread the buildings over more ground.

The two wards for males and females were placed at the end of the site further from the enclosure gate, and the accommodation for families of patients was built near the door, as far from the actual hospital as possible; the arrangement shown was adhered to, as far as feasible, in all Government Hospitals.

All hospital buildings were constructed of the lightest and cheapest materials compatible with safety. The posts and framing were of bamboo or benteak set well into the ground on a 12" plinth; the sides were of single bamboo matting; the roofs of two thicknesses of jowli or cadjan (plaited palm leaf in general use in tropical countries), the latter in some instances lined inside with cloth. The whole hospital, inside and out, except the roof, was lime washed at intervals.

The cook-houses were constructed of corrugated iron, both roof and sides, on wooden framing.

Drinking water was drawn from two or more taps to meet the wants of the various castes.

As regards sanitary arrangements, the privies were on the dry system, the nightsoil being removed by hand after being disinfected with perchloride of mercury or carbolic acid; a washing-place, with one or more taps, with a paved space around it, was always provided in a convenient position, and from that and the bath-rooms in connection with the Nurses and Hospital Assistants' quarters and the various cook-houses, was led a small open drain constructed of 4" stoneware pipes cut in half and laid on concrete, connected either with cesspools or the nearest available drain.

It has generally been found convenient to supplement the buildings shewn on the plan by a general cook-house for the wards, and an extra bath-room for Nurses' quarters; in some hospitals which were continually full, a dispensary and office were also given, otherwise a corner of one of the wards was made use of for this purpose. It was also found desirable to place a width of rabbit-wire netting round the lower walling of the mortuary, or to supply a wire bier cover to prevent dogs interfering with corpses lying therein; the mortuary was, wherever practicable, placed well away from the hospitals and quarters.

The cost of the buildings above described averaged annas 6 per square foot of area covered ; the arrangement and style were found to be eminently successful, and the generality of Government Hospitals were much cooler than those of private hospitals located in permanent buildings.

The staff of a one-section hospital was fixed as follows :—

2 Nurses.	1 Bheesty.
1 Ayah.	2 Sweepers.
1 Hospital Assistant.	2 Nurses' Servants.
4 Ward Orderlies.	1 Hospital Cook.

If there were many severe cases, it was found necessary to supplement the staff with an extra nurse, to increase the number of ward orderlies, and when the caste and other conditions of the patients required it, the number of cooks also. The equipment of furniture, clothing, medicines, and instruments of a one-section hospital are all given in the Appendix No. 8.

PRIVATE HOSPITALS.

The promulgation of the order by the Committee that all cases of plague must invariably, and without exception, be removed to the Hospital at once, raised many intricate questions relating to caste, race, habits, food, religious scruples, and such like difficulties, which required very careful treatment.

It was suggested to the leaders of the various communities that each caste and sect should establish either a separate Hospital, supported and managed entirely by their own medical board, officers and staff, or that they should maintain a separate ward, or separate beds, for their own people in one of the Government Hospitals.

The suggestion was at once adopted by a number of wealthy and influential citizens of all creeds ; applications for what were termed "private hospitals" rapidly came in. The moral as well as the practical support that the Committee received on this account was invaluable, as it at once quelled the misgivings and fears of the majority of the people, who were apprehensive on those matters and passively resisted ideas so contrary to their ordinary modes of life.

It was, however, distinctly explained that a private hospital, open to all members of any particular caste or sect, could alone be sanctioned ; some applications for hospitals for private individuals, or for a group of private individuals, were refused accordingly. The Committee declined to admit any difference in treatment between the rich and the poor ; the closest attention was paid to the wants of all ; and the hospitals were utilized for every class of people in the same caste or sect.

The Committee had, however, not only to consult the wishes of a large and easily excitable populace, but they had to face a serious amount of obstruction against the course they had adopted. In the published records of opinions by eminent Scientists and Medical authorities, there was a great diversity of opinion on the private hospital system, and it was held by many persons that the multiplication of Plague Hospitals in the City and their location in thickly-populated quarters would cause virulent centres of infection, which would be a source of greater danger than the alternative of treating the sick persons in their own houses.

This important question was keenly discussed and considered, but the Committee adhered to its decision that the private hospital system would meet the requirements of many who by reason of caste or custom would not have gone to hospital under any circumstances without forcible removal.

Accordingly applications for private hospitals were sanctioned on the distinct understanding that all arrangements in connection therewith would be carried out by a hospital board, and that the medical attendants and staff should be under the supervision and control of the Medical Officer of the District in which the private hospital was located; and this officer was made responsible for compliance with the orders of the Committee.

The results of the system have fully realised the convictions of the Committee, and the opinion, generally expressed in many quarters, that the private hospitals would be a further source of danger to the City proved erroneous; the careful supervision maintained by those in charge of these institutions secured the result that in no single instance was the disease spread by the proximity of a plague hospital to other dwelling houses, and notably there was an example in the Khoja Hospital in Tantanpura Street, which had a number of patients and was next door to an Orphan School in which none of the children suffered from plague.

The Committee are most grateful to the munificent founders of these hospitals, to the gentlemen who formed the hospital boards, and to the medical men in charge, who so cordially and efficiently worked in concert with the Committee and its officers for the public benefit.

From the list of private plague hospitals shewn on Plan No. 1, it will be seen that all castes, sects, creeds, and races joined in the movement.

The small Chinese community in Bombay also offered to start and equip a hospital, but the offer was held in abeyance owing to the decline of the Plague.

HOSPITALS.

REPORT OF ALL GOVERNMENT HOSPITALS, BY THE MEDICAL OFFICERS IN CHARGE OF THEM.

Report of Pilot Bunder Hospital.

GOVERNMENT HOSPITAL No. 1.

This Government Hospital was opened on 10th March 1897 and closed on 31st March 1897, several cases were under treatment before admission; hence their short retention in hospital. Amongst the Regimental followers from Colaba were many severe cases. In all buboes were present, of the neck and groin principally. In three, infections proved to have taken place in the tonsils, and in two the removal of morbid material from buboes was followed by aggravation and death.

NOTE.—No inoculation by serum. Two pregnant women aborted and died.

General Treatment—

On admission an antiseptic bath and a strong purgative.

1st day liq. hydrarg. perch. 3 drs. every second hour.

2nd day do. do. 1 dr. every third hour.

(*Bubo*)—(1) painted with glycerine and belladonna, or
(2) treated with hot fomentations, or
(3) incised.

Other symptoms were treated as they arose.

Stimulating Mixtures—Ammon. carb.

Nux Vomica.

Ammon. aromat.

Alcoholic Stimulants—Rum (Jamaica.)

Brandy.

STATISTICS.

To this hospital there were 34 admissions. Two of these showed pneumonia, one of which recovered.

Cases ... 34

Recoveries ... 3 } Of the 3 recoveries, the following are the details :—
Transfers ... 11
Deaths ... 20

No.	Sex.	Age.	Occupation.	Admission.	Symptoms.	Discharge.
11	Male ...	25 ...	Cook ...	14-3-97	Bubo groin ...	20-3-97.
19	" ..	30 ...	Milkman ..	21-3-97	" " ..	29-3-97.
20	Female ...	10 ...	.....	28-3-97	" " ...	28-3-97.

Transferred... 11 } Of the 11 transfers, the following are the details :—
Died ... 20 }

No.	Sex.	Age.	Occupation.	Admission.	Symptoms.	Transfer.
1	Male	40	Cook	11-3-97	Bubo arm	20-3-97.
8	"	6	.....	13-3-97	Bubo groin	1-4-97.
12	"	25	Cook	15-3-97	" "	31-3-97.
14	Female	30	.....	18-3-97	Pneumonia	1-4-97.
17	"	30	Sweeper	19-3-97	Bubo groin	20-3-97.
18	Male	25	Fitter	20-3-97	Bubo axilla	1-4-97.
25	"	14	Dresser	23-3-97	Bubo groin	1-4-97.
32	"	17	.....	29-3-97	"	1-4-97.
33	"	17	.....	29-3-97	Bubo axilla	1-4-97.
34	"	15	.....	29-3-97	Bubo groin	1-4-97.
2	"	28	Woodman	11-3-97	Bubo neck	20-3-97.

Deaths 20. Of the 20 deaths, the following are the details :—

No.	Sex.	Age.	Occupation.	Admission.	Symptoms.	Death.
3	Male	25	Cook	11-3-97	Bubo groin	5th day.
4	Female	40	.....	12-3-97	Bubo neck. Tonsillitis	3rd "
5	Male	12	Cooli	12-3-97	Bubo groin	1st "
6	"	15	Carpenter	12-3-97	"	1st "
7	"	12	.....	12-3-97	Bubo neck. Tonsillitis	3rd "
9	Female	24	Labourer	14-3-97	Bubo groin	4th "
10	"	9	.....	14-3-97	Bubo neck	4th "
13	Male	35	.....	17-3-97	B. groin. Doublepneumonia	1st "
15	Female	25	.....	18-3-97	Bubo neck*	4th "
16	Male	47	Cook	19-3-97	"	4th "
20	"	24	.....	22-3-97	"	1st "
21	"	20	Cook	22-3-97	Bubo groin*	3rd "
22	"	50	.....	22-3-97	"	1st "
23	"	25	Cooli	22-3-97	"	7th "
24	"	22	"	22-3-97	" Sore throat.	5th "
26	"	5	.....	24-3-97	Bubo neck	1st "
27	Female	22	.....	27-3-97	"	1st "
28	"	25	.....	28-3-97	"	1st "
30	"	10	.....	29-3-97	"	1st "
31	"	30	.....	29-3-97	Bubo groin	2nd "

* 15, 25, serum ejected, from gland by capillary tubes.

† 27, 28, aborted.

The nourishment taken by these patients was extremely small and consisted almost wholly of milk and a little alcoholic stimulant.

Report of Jamsetjee Bunder Hospital.

GOVERNMENT HOSPITAL No. 2.

This hospital opened on 1st April 1897 and received patients to 10th May by direct admission or transfer. Out of the 33 cases received, 19, or 57·57 per cent. proved fatal.

Hospital Staff.

D. M. O.—Surg.-Lt. Howell, A.M.S.

S.-D. M. O.—Doctor N. E. Chubb,

Mr. T. C. Bhaskar.

Hospl. Asst. Gangaram Hari.

Hospl. Asst. Shaikh Abdul Rahman.

Nurses—Mrs. Baker, Miss Savage, Miss Winscombe, and Miss Morey.

Two Ayahs.

One Sweeper.

Cases ... 33
 Discharged ... 9
 Transferred ... 5
 Died ... 19

Of the 9 cases discharged, the following are the details:—

No.	Sex.	Age.	Occupation.	Admitted.	Symptoms.	Discharged.
1	Child.	6	Cooli	1-4-97	Bubo groin	4th day.
2	Male	25	.....	1-4-97	"	4th "
3	Female	30	Cook	1-4-97	"	1st "
5	Male	14	.....	1-4-97	Pneumonia	12th "
6	"	17	Dresser	1-4-97	Bubo groin	13th "
7	"	17	.....	1-4-97	"	12th "
8	"	15	.....	1-4-97	Bubo axilla	27th "
10	"	7	.....	1-4-97	"	12th "
11	"	30	.....	1-4-97	Bubo groin	4th "

N.B.—Buboes in all cases but one. Buboes in groin in six out of eight cases.

* Received from Pilot Bunder Hospital.

Remarks on Nos. 3, 5, 6, 7, 8, 10, 11 in the above list.

CASE.

3. A very severe case, taken on the first day of attack, to which recovery may be attributed. Enlarged glands. Temperature not above 103°. But great prostration. Some pneumonia. Slow recovery.
- 5 & 6. Admitted in early stage. Enlarged glands in groin; temperature rose to 104°. Made a good recovery.
7. Enlarged axillary glands and high temperature. No suppuration.
8. Similar case, enlarged glands in groin.
10. Bubonic type, glands in groin attacked. Temperature rose to 105°, with delirium; convalescence rapid after fall of temperature.
11. A case of simple bubo.

Transferred 4. { 2 to Grant Road Hospital,
 { 2 to Parel (Convalescents).

Of the cases transferred, the following are the details:—

No.	Sex.	Age.	Occupation.	Admission.	Symptoms.	Transferred.
4	Male	25	Fitter	1-4-97	Bubo axilla	9-5-97
24	"	35	...	20-4-97	...	9-5-97
29	Child	7	...	28-4-97	...	9-5-97
32	Male	35	Plumber	2-5-97	...	9-5-97

Remarks on Nos. 4, 24, and 29 of the above cases.

CASE.

4. Admitted early. Severe bubonic type. Left axillary gland enlarged. Whole glandular contents of axilla sloughed away through inflammation and necrosed. Axilla healed slowly with little suppuration. Great prostration, delirium and unconsciousness for some days. Convalescence prolonged and attended by some loss of power in the legs.
24. Found concealed. Plague diagnosed from tongue, pulse and temperature. Buboes appeared after some days. Transferred to Parel.
29. Glands in neck enlarged and suppurated; abscesses in several parts. Tonsils largely inflamed.

Died 19.—Of the 19 fatal cases, the following are the details:—

No.	Sex.	Age.	Occupation.	Admitted.	Symptoms.	Died.
9	Male	35	Syee	1-4-97	.....	1st day.
12	"	26	Cook	2-4-97	.....	3rd "
13	"	24	.....	2-4-97	.....	3rd "
14	"	35	Cooli	2-4-97	.....	1st "
15	"	40	Cook	5-4-97	Bubo groin	4th "
16	"	25	Barber	7-4-97	.....	2nd "
17	"	18	Cooli	9-4-97	Bubo groin	2nd "
18	Female	25	.....	14-4-97	.....	5th "
19	Male	38	Cooli	15-4-97	.....	3rd "
20	"	38	Hospl. Asst	15-4-97	.....	3rd "
21	"	30	Barber	16-4-97	.....	1st "
22	Female	50	.....	17-4-97	.....	2nd "
23	Child	12	.....	20-4-97	.....	1st "
26	Male	30	Butler	23-4-97	Rapid shallow respiration, convulsion.	6th "
27	Female	25	.....	26-4-97	All food refused, convulsion.	4th "
29	Child	9	.....	26-4-97	Tonsils inflamed, convulsion.	2nd "
30	Female	14	.....	30-4-97	.....	2nd "
31	Male	32	.....	30-4-97	.....	1st "
32	Child	6	.....	3-5-97	.....	2nd "

Remarks on Nos. 20, 25, 26, 27, and 28 of the above cases.

20. Hospital Assistant Shaik Abdul Rahman, at Colaba, got inoculated with plague by using a patient's soap to wash an abrasion and died from the disease.

On 14th April patient complained of headache, pain in the limbs, and general malaise. His temperature when first taken was 104°, but rose in the evening to 106°. During the night he complained of pain in the right groin and some swelling was demonstrable.

Next day (15th April 1897) he was admitted to the Plague Ward. Temperature throughout the day was 105°; pulse, 120; respiration, 48. In the evening he was placed in the wet pack and his temperature fell half a degree; at 2 a.m. (16th April) it was 104°.

On 16th April 1897, I saw him for the first time and took over his case from Surgeon-Major Culling. His pulse was small, compressible, 120; temperature, 104°; respiration, 40. There was a bubo in the right groin which was very tender and painful. He was quite conscious, but inclined to be talkative and very restless. In the evening he complained of epigastric pain. Evening temperature was 101°, pulse more feeble 120, respirations unchanged.

On 17th April 1897, patient did not sleep during the night. Temperature 101·8. Pulse and respiration unchanged in frequency, but respirations more shallow. He complained of tightness across chest and then vomited a small quantity of "coffee-ground" vomit. This gave him great relief. Later on in the morning he became delirious and vomited again some altered blood. His temperature rose to 105°, and he died at 3-45 p.m.

Treatment.—Liq. hydrarg. perchlor, free stimulation, ice to head, &c.

26. Bubonic type. Respirations very shallow and rapid, but no dulness or pneumonic signs over the chest. Convulsions and high temperature preceded death.

27. A very severe case. All food refused; convulsions.

28. Great difficulty in swallowing. Inflamed tonsils; some convulsions.

In the five fatal cases hæmorrhage either from stomach or rectum was present. The hæmorrhagic cases invariably proved fatal. Cases from Upper Colaba seem severer than those from Lower.

General Treatment—

The most effective treatment was that by stimulants and hypodermic injections of strychnia, with light nutritious food.

On entrance, an antiseptic bath was followed by calomel powder.

Rum 2 dr. a teaspoonful every half hour.

Liq. hyd. perohl. 1 dr.

Aqua 1 oz.

} every 2nd hour.

NOTE.—Of the admissions to this hospital, 14 died within three days, and of these, 10 within 24 hours of admission. Arriving in a moribund state, they could only be treated with hypodermic injections (brandy and strychnia) and sustained by enemata.

Modikhana Plague Hospital.

GOVERNMENT HOSPITAL No. 3.

This hospital, successively in charge of Surgeon-Majors Damania and Routh, with three Nurses and three Hospital Assistants, established 31st March 1897; became, on its closure, 10th May 1897, a segregation camp for observation of suspicious cases, and so remained till removed, 7th June 1897.

Cases	18	} Of the 18 cases admitted, 6 proved fatal. In all cases (11) where buboes were not developed, there was marked delirium.
Discharged	...	...	1
Transferred	...	...	11
Died	...	...	6

General Symptoms—

1. Excessive drowsiness.
2. The tongue was red and serrated at the tip and margins, coated on the centre.
3. The eyes greatly injected.

In one case bloody urine, in another bloody vomit were observed; the latter a woman who died of pneumonic and bubonic types combined.

Case No. 1.

Details follow of three cases, two discharged cured, one transferred to Parel.

Boy, aged 8. Mahomedan, from Karachi, admitted on suspicion, with tongue slightly red and coated.

April 15, 1897.

On the third day showed slight enlargement of right femoral and left inguinal glands.

17

The symptoms of the tongue became aggravated, and

19

He complained of pain in the glands. The bowels being moved, the tongue showed less coating.

21

The pain in the glands continued, but without further enlargement elsewhere.

22

He complained of slight pains in the neck, but after a good night

24

Awoke with very little pain, and

25

Having slept without a draught, felt free from pain in the glands, which appeared decreasing.

26

His eyes were no longer injected, and

27

The buboes, both in neck and groin, diminishing, he was on the following day

28

Transferred convalescent to Parel Hospital.

30

Case No. 2.

- April 15 Girl, aged 7, sister of the last, admitted the same day (with no glandular enlargements) on suspicion.
- 17 Showed tongue coated and red marginally.
- 18 With signs of drowsiness.
- 19 Removed to plague ward.
- 20 Drowsiness and enlargement of glands on both sides and some constipation.
- 21 Increase of tongue-coating and swelling in the neck continuing throughout the next day.
- 22 The tongue began to clear, and from this point, with regularity of bowel action restored, the patient passed, through painful swelling of knee and ankle joint (with two incisions), to convalescence and removal to Parel Hospital.

Case No. 3.

Admitted April 15. Youth, aged 20, nine days after arrival from Calcutta by sea: reported that three days after landing he noticed enlargement of his glands and puffiness of the face. He exhibited on admission œdema of the feet, injection of the eyes (slight), and enlargement of glands below the jaw, in the neck on each side, and in both groins, without pain. In this case there was no marked rise in temperature, never above 100°6.

This patient's illness was short. The œdema subsided on the day after admission. And though he complained on the 17th of pains in the sub-maxillary glands on the right side, no remarks are made on his condition until the 22nd, when with small glandular enlargements, and feeling on the way to recovery, he was transferred to Parel Hospital.

Temperature ranged between	...	...	100°6—97
Pulse...	...	...	104—76
Respiration ..	...	...	22—15

No statement is made as to the ultimate cause of death in fatal cases, whether due to failure of the heart or of respiration; but of the six deaths—

One occurred in 10 hours after seizure or admittance.

One	"	24	"	"	"
Two	"	36	"	"	"
One	"	48	"	"	"
One	"	96	"	"	"

Of four *post mortem* examinations, the result was discovery of *petechiæ* in most of the organs examined.

General Treatment—

1. Few drugs with
2. Free stimulation.
3. Liq. hyd. perchlor.
4. Later on carbolic acid was tried with success.

Liq. hyd. perchlor 80 mm. dose, in acute cases, every 2 hours for first 48 hours with Dicip. C. Strychn. every 3rd hour.

For example, with liq. hydrarg. treatment four out of seven patients died. With carbolic out of six only one died.

Type—

Of the 18 cases under treatment, 7 only were pneumonic, and 11 hyperpyrexia only, showing no glandular enlargement.

Report of Charni Road Hospital.

GOVERNMENT HOSPITAL No. 5.

This hospital opened 25th March 1897. Closed 10th May 1897. Admitted 70 patients, of which 45 died.

Cases ...70 } Of these, four cases were inoculated, three with Dr.
Recovered...25 } Yersin's serum and one with Dr. Haffkine's, with the follow-
Died ...45 } ing results :—

Case 1.

Male, aged 16. Inoculation with Dr. Haffkine's Serum.

Age.	Occupation.	Duration of disease.	Caste.	Date.
16	Coachman.	3 days.	Hindu.	13-4-97

The patient arrived conscious and able to walk.

Condition—

Temperature 102

(a) Pulse 104

Respiration... .. 20

Swelling in right inguinal region.

(b) Eyes slightly suffused.

Tongue furred.

Inoculated by Professor Haffkine, 13th April 1897. *One* inoculation only. Developed symptoms of bubonic fever on 30th April 1897.

During the first 24 hours—

The temperature ranged between 100° and 102·4.

The pulse „ 124 and 92.

The respiration „ 30 and 24.

At 6-15 p.m. 40 cc. of Yersin's serum No. 38 were injected. Till the morning of the 14th the temperature and pulse remained high, though fluctuating, the respiration regular.

From this date the patient made a gradual recovery, and was discharged cured on 4th April 1897.

Case 2.

Male, aged 25. Inoculation with Dr. Yersin's serum.

April 9th.

Age.	Occupation.	Duration of disease.	Caste.	Issue.
25	Soldier, 21st B. I.	3 days	Mahomedan	Death.

The patient arrived in a feverish state (of three days' duration) on 9th April 1897.

11 a.m.

Condition—Swollen inguinal glands on both sides.

Temperature 101·4

Pulse 108

Respiration 24

6 p.m. No movement of bowels since morning. After initial treatment
Inoculation with 60 cc. of No. 38 injection in flank.

	Temperature.	Pulse.	Respiration.
10 p.m.			
1 a.m.	103°	(?)	(?)
4 a.m.	100	100	30
7 a.m.	98.4	80	25
11 a.m.	100	80	30
3 p.m.	101	79	29
6 p.m.	103.6	110	36
7 p.m.	103	78	32
10 p.m.	103.6	84	36
1 a.m.			
4 a.m.			
7 a.m.	40 cc. of serum No. 38 injected.		
8 p.m.	100	100	30
6 p.m.	102	100	30
7 a.m.	100	99	30
11 a.m.	100	99	26
	101.2	100	30

Eyes much injected. Left inguinal gland large, but not painful.

102	100	30
101.4	100	30

Case 3.

Male, aged 60. Inoculation with Dr. Yersin's Serum.

Age.	Occupation.	Duration of disease.	Caste.	Issue.
35	Domestic servant.	Two days	Brahmin	Recovery.

1897 April 8

The patient complained of fever, shivering, headache. He had a furred tongue and tenderness in the groin.

Temperature was 105

Pulse ... 120

Respiration ... 40

At 3-30 p.m. he was inoculated with 60 cc. of Yersin's serum. Injection in both flanks. His pulse, respiration, and temperature were taken every hour.

/ *Course of the Disease.*

After shivering fit during previous night, tongue clear. (Bubo canterized before admission.) May 3

Pulse 80
 Respiration... .. 24 *
 Bowels clear.
 Slight collapse and recovery.

1 { Pulse 72
 { Respiration 18 4-5.
 { Sleep good, improving.

2 { Pulse 70
 { Respiration 18 5.
 { Sleep good, tongue clean.

3 { Pulse 70
 { Respiration 18 6.
 { Sleep good, bowels regular.

4 { Pulse 74
 { Respiration 32 7.
 { Bowels regular and tongue clean.

Pulse 72
 Respiration 22 8.
 Bowels regular and tongue clean.

The same. and 9.

Discharged cured. 10

Issue—Recovery.

Case. 4.

Inoculation with Dr. Yersin's serum. Arrived with fever. April 9, 9

Temperature 101.4.

Pulse rapid.

Swelling in right groin.

Had previously taken purgatives.

Treatment—

20 cc. of serum in left flank. 7-15.

Temperature 104

Pulse 104

Respiration 28

20 cc. in right flank. 7-20.

10 cc. to right and below 1st injection.

No mixtures. Diet—Egg-flip and mutton broth.

Condition during Convalescence—

Temperature.	Pulse.	Respiration, taken hourly,
Ranged from 104-98.2	120-82	40-20.

Bowels regular and tongue clearing throughout. Discharge from wound slight.

Issue—Recovery.

Case 5.

Male, aged 35. Inoculation with Dr. Yersin's serum.

Arrived with—

1. Enlargement of left inguinal gland.
2. Drowsiness.
3. Congestion of eyes.
4. Slightly coated tongue.

Temperature 104. }
Pulse 150. } Three injections of 20 cc. were made.
Respiration 42. }

Treatment—

No treatment, but stimulants and food.

Symptoms—

Muttering delirium and semi-coma. Bubo opened freely.

Issue.—Death from heart failure.

Statistics are given below with the District Medical Officer's remarks on the general features of mortality and rates as to age and sex.

Tables giving Details of Patients admitted to Charni Road Plague Hospital from 25th March to 10th May 1897.

TABLE I.—Showing total number of cases, deaths and percentage of mortality.

Sex.	No. of cases.	No. of deaths.	Percentage of mortality.
Males	54	35	64·81
Females	16	10	62·50
Total ...	70	45	64·28

TABLE II.—Number of cases and deaths at different ages in both sexes.

Sex.	No. of cases under 10 years.	No. of deaths under 10 years.	No. of cases, 10 to 20 years.	No. of deaths, 10 to 20 years.	No. of cases, 20 to 40 years.	No. of deaths, 20 to 40 years.	No. of cases, 40 to 60 years.	No. of deaths, 40 to 60 years.	No. of cases over 60 years.	No. of deaths over 60 years.
Males	5	2	13	6	28	20	8	7	...	...
Females	2	1	6	4	6	3	2	1	...	...
Total ...	7	4	19	10	34	23	10	8	...	...

TABLE III.—Percentage of mortality at different ages, males and females.

Sex.	Under 10 years.	From 10 to 20 years.	From 20 to 40 years.	From 40 to 60 years.	Over 60 years.
Males	40·0	46·15	71·42	87·5	...
Females	100·0	66·66	50·00	50·0	...
Males and Females	57·14	52·63	67·64	80·0	...

From the above tables it would appear—

1st—That the most susceptible age is between 20 and 40 years; the least susceptible over 60 years.

2nd—That males are more susceptible than females.

3rd—That the highest mortality, 80 per cent., occurred between the ages of 40 and 60 years.

4th—That the mortality is higher in males than females.

5th—That the mortality amongst females under 10 years old is 100 per cent., but this is taken from only two cases, and more data would be required to be of importance.

Report of Police Hospital, Foras Road.

GOVERNMENT HOSPITAL No. 6a.

In charge of Dr. Sydney Smith.

This hospital was opened on 24th March 1897, and closed on the 7th April 1897. There were 28 admissions, of which 16 proved fatal (a percentage of 57·14). Two only of these survived the third day after admission.

Cases	... 28	} Of the nine cases discharged, the following are the details :—
Discharged...	9	
Transferred...	3	
Died	... 16	

No.	Rank.	District.	Admission.	Symptoms.	Discharged.
1	Naik	Khetwadi	24-3-97	Bubo in groin	3-5-97
2	"	Nul Bazaar	25-3-97	Bubo in groin	20-4-97
3	Sepoy	Parel Lalwadi	25-3-97	Ulcers abdominal&perineal	30-4-97
4	"	Worli	25-3-97	Bubo in groin	30-4-97
15	"	Matunga	1-4-97	Bubo in groin	21-4-97
19	Ward boy	Dongri	5-4-97	No bubonic signs	11-4-97
22	—	1st Nagpada	15-4-97	Bubo in groin	23-4-97
64	P. C.	Market Section	20-4-97	Enlarged glands inguinal	27-4-97
22	P. C.	Water Police	21-4-97	Swelling in neck	1-5-97

Cases	... —	} Of the three cases transferred the following are the details :—
Discharged...	—	
Transferred...	3	
Died	...16	

No.	Rank.	District.	Admission.	Symptoms.	Transferred.
9	Sepoy	Mandvi	27-3-97	Bubo neck and groin	7-5-97
23	P. C.	Market Section	16-3-97	Bubo in groin	7-5-97
...	Recruit	G.I.P.R. Police	30-3-97	Enlarged gland inguinal	7-5-97

Died... ...16 { Two of those were women, the wife and daughter-in-law,
respectively, of members of the Force—Nos. 17, and 18.

No.	Rank.	District.	Admission.	Symptoms.	Death.
5	Ramosi ...	Dadar ...	25-3-97.	Bubo in groin ...	27-3-97.
6	1st Class C. ...	Colaba ...	26-3-97.	Ditto ...	27-3-97.
7	Sepoy ...	Worli ...	26-3-97.	Bubo, left axilla, lungs affected.	29-3-97.
8	Coachman ...	Mahim ...	26-3-97.	Enlarged glands inguinal, (both.)	29-4-97.
10	Sepoy ...	Govt. Dockyard...	27-3-97.	Bubo groin ...	28-3-97.
11	.. ...	Mahalakami ...	29-3-97.	No account ...	29-3-97.
12	Mtd. Police ...	Mahim ...	30-3-97.	Bubo groin, and convulsions	2-4-97.
13	L. Naik ...	Temp. Mohulla...	31-3-97.	Great pain in axilla, no swelling.	3-4-97.
14	Ramosi ...	Municipalities ...	1-4-97.	Rusty sputum, crepitation cough.	11-4-97.
16	Sepoy. ...	Baz. Gate, Fort...	1-4-97.	Buboes, both femoral, coma	3-4-97.
17	Wife of a Sepoy..	B. B. & C. I. Ry..	1-4-97.	Bubo groin ...	3-4-97.
18	D.-in-law "	Nagp. Phirbai L..	2-4-97.	Bubo and abdominal pains..	13-4-97.
20	Ramosi ...	Bazar Gate ...	7-4-97.	Enlarged glands neck and groin, buboes.	9-4-97.
22	" ...	Grant Road ...	8-4-97.	(Buboes both groin) ...	9-4-97.
25	P.C. ...	Water Police ...	20-4-97.	Delirium, tetanus, and coma	20-4-97.
27	Ramosi ...	Kaladni Road ...	26-4-97.	Acute diarrhoea, high fever..	27-4-97.

• Sat up suddenly and fell dead.

In nearly all the cases admitted to this hospital the premonitory symptoms were the same.

Premonitory Symptoms—

1. Rigor (acute).
2. Fever (high).
3. Glandular enlargement in groin.
4. Or neck.

In several cases these were either neglected by the patient till his case became serious, or ignorantly treated with native prescriptions with the same result, before the hospital was sought. From the general nature of the reports of individual cases, it would seem that being in the public service, most of these men stood by their work as long as they could before giving in to the sickness which was upon them. Two of the fatal cases resulted from abrasion or open wound. Two were female cases, relatives of men in the Force.

In two cases only out of 28—were there axillary buboes. While in all the remaining cases there were inguinal buboes or enlargements.

General Treatment—

Stimulating mixtures.

Iodoform and carbolic dressing of wounds.

Soda and bromide for delirium with injection of morphia.

Calomel purge.

Injection strophanthi 20 min. to improve the pulse.

Report of Wari Bunder Hospital.

GOVERNMENT HOSPITAL No. 8.

* This hospital was opened on 26th March 1897, and closed on 18th May 1897.
Received 56 cases in all, of which 28 proved fatal. Death-rate, 50 per cent.

Cases ... 56 }
Recovered ... 28 } Of these 56 cases the following are the details :—
Died ... 28 }

A.—Death Rate.

Sex.			Death-rate.			Caste.		
Male.	Female.	Children.	Male.	Female.	Children.	Hindus ...	...	...
36	14	6	55	43	17	Mahomedans ...	...	45
						Native Christians ...	...	7
						Jews ...	...	2

B.—Site of Bubo.

Femoral.	Inguinal.	Cervical.	Axillary.	Cervical & Inguinal.	None.
15	10	9	6	4	6

C.—Pneumonic Type—6 cases.

Observations—

There are three principal forms of bubonic plague.

1. Lymphatic, the simplest.
2. Glandular enlargement.
3. Pneumonic.

(1) *Lymphatic*.—Affection of lymphatic glands, whether femoral, inguinal, cervical, or axillary.

Here the seat of inoculation is local, due to abrasion (any form of solution of continuity).

The local condition involves generally—

1. Constitutional disturbance.
2. Fever (101—3).
3. Rapid pulse (120—30).
4. Furred tongue.
5. Constipation.
6. Headache and pains in back and legs.
7. Tendency to suppuration of bubo, leading to general good recovery.

Or the above symptoms (1, 2, 3, 4) may be accompanied by extreme

- (1) Prostration and the tongue (4) be swollen, glazed, indented, and tremulous.
- (2) Albuminuria is present.
- (3) Hæmorrhage nasal and/or enteric.
- (4) Jaundiced, drawn, and haggard countenance.
- (5) Enlarged liver and spleen.
- (6) Suffused conjunctivæ.
- (7) Restlessness and insomnia.
- (8) Violent delirium.

Generally terminating Fatally.

NOTE.—Enlargement of cervical glands the more severe type.

(2) *Non-lymphatic*.—More serious. Corresponds with the lymphatic with the exception of non-glandular enlargement, as in 1 (2). But the constitutional disturbance and prognosis are very grave.

(3) *Pneumonic Type*.—Clinically difficult to distinguish from ordinary lobar pneumonia; symptoms being very similar.

Extraordinary Sign.—Suffusion of conjunctivæ.

Diagnosis.—Requiring bacteriological examination.

Prognosis.—Bad.

NOTE.—All six cases admitted proved fatal.

Observations on General Treatment.—

Free stimulation.

1 (Drugs).—Ammonia carbonate.

Strychnine.

Alcohol, freely.

2 (Diet).—Milk, broth, beef-tea.

3 (Drinks).—Barley water; lemon water.

Arrowroot and rice congee.

NOTE.—Mineral waters not to be recommended; as inflative and impedimental of heart's action.

4 & 5 (To reduce temperature).—Tepid sponging and ice-pack, bromides and salphonal.

6. Suppuration of bubo to be encouraged, but *not hasty* incision after suppuration.

7. Careful nursing essential.

Acute Stage.—Acute stage of disease, ten days to three weeks. The first two weeks to the crisis. In virulent cases, death in 36 hours, or convalescence very slow, and subject to relapse.

Sequelæ of Plague.—

1. Aphasia.

2. Hæmiplegia.

3. Local paralysis and twitching.

Disinfection of Premises.—

1. Free exposure to air and light.

2. Lime-washing, &c.

3. Carbolic acid solution (1 in 40.)

4. Solution perchloride of mercury.

Report of Reay Road Government Hospital.

GOVERNMENT HOSPITAL No. 10.

Hospital Staff.

Medical Officer in charge, Dr. Britto.

1 Compounder.

2 Nurses.

2 Ayahs.

4 Clerks.

10 Ward-orderlies.

3 Bhistsis.

This hospital opened on 1st April 1897 and closed on 4th May 1897; received 22 plague patients, of whom 8 died.

After 4th May 1897 it became a segregation camp for suspects under Sea-traffic Inspection.

Cases	... 22	} Of the 22 cases treated, the following are the details of two selected cases which are accompanied by charts:—
Absconded	... 1	
Recovered	... 3	
Transferred	... 10	
Died	... 8	

CASE A.

Age 25. Hindu.

Patient's state on admission (4th day of illness).—

Temperature	...	...	...	...	106
Pulse	...	...	...	...	110
Respiration	...	...	...	...	30

Note that *pneumonic* and *cerebral* symptoms were developed *simultaneously* and *independently*.

CASE B.

Age 25. Hindu.

Patient's state on admission (a transfer from Observation Camp)—

Temperature	...	...	...	...	...	106
Pulse	...	...	...	...	...	110
Respiration	...	...	...	...	...	35

with glandular swelling in left groin. In the evening he was seized with epilepsy, and subsequently became unconscious, in which state he died on the 2nd day after admission.

Symptoms.—*Urine* scanty, passed in small quantities, and high-coloured. A case of the *nephritic* type.

Sion Hospital.

GOVERNMENT HOSPITAL No. 16.

Sion Hospital was built on the high ground situated east of the village of Sion Koliwada. It contains three wards nominally of 10 beds each, but capable of holding sixteen beds each if required to do so.

In addition it was provided with the usual out-door accommodation of a two-section hospital, including temporary nurses' quarters, a sub-divisional office, two rows of segregation huts for the relations of patients, and a barrack for accommodating a detachment of infantry posted there for the purpose for providing men for search and causeway guard work; which incidentally proved useful as a hospital guard.

The Staff consisted of one Medical Officer, two hospital assistants, one clerk, two nurses, six ward-orderlies, and a menial staff as detailed in the attached tabular summary. The Sub-divisional Medical Officer of Sion, Bhoiwada, and Sewree also did duty as Medical Officer of the Hospital in a most satisfactory manner. The nurses worked zealously and conscientiously throughout. Of the two hospital assistants, one remained for only a short time, when he was transferred, and the other, Mr. Purbaram Tooljaram, who did good work eventually, caused much annoyance when first appointed by refusing to reside in or near the hospital. Of the six ward-orderlies, four remained throughout and worked well, and the other two were transferred to Worli. Considerable difficulty was experienced in procuring menial servants, and in retaining them when appointed, owing to the distance from Bombay and their awe of the plague. The hospital was used for cases and suspects found in Western Dharavi, Sion, Govari, Matunga, Vadalla, and Sewree and also for cases and suspects detained by the Medical Inspection staff at the Sion-Coorla Causeway. It was opened on the 27th of March and closed on the 17th of May 1897. There were 67 admissions, of whom 23 died (11 within 24 hours after admission) and 44 recovered.

Summary of Report on Sion Hospital.

Hospital opened	...27-3-97	Recoveries	...	...	44
Hospital closed	...17-5-97	Deaths	...	...	23
Admissions	... .. 67	Transferred convalescents	...	...	...

Staff.

Medical Officer	...	1	Cooks	...	...	2
Hospital Assistant	...	1	Dhobie	...	...	1
Clerk	...	1	Sweepers	...	...	6
Nurses	...	2	Bhisti	...	...	1
Ward-orderlies	...	4	Peon	...	...	1
Ramosees	...	2	Ayah	...	...	1

Mahim Causeway Hospital.

GOVERNMENT HOSPITAL No. 17.

The Mahim Causeway Hospital was built on the seashore north of Mahim Fort, a house west of the Fort having been rented for the nursing staff. The hospital contained three wards, nominally of ten beds each, but capable of holding sixteen beds each if required to do so. It was also provided with the usual outdoor accommodation of a two-section hospital, including two rows of segregation huts for the relations of patients and a sub-divisional office. Adjoining the hospital was a temporary barrack for accommodating a detachment of infantry posted there for the purpose of providing men for search and Causeway guard work, which incidentally proved useful as a guard to the hospital.

The Staff consisted of one Medical Officer, two hospital assistants, one clerk, one compounder, three Sisters, four assistant nurses, eight ward orderlies, two police runosis, and an ample menial staff as detailed in the attached tabular summary. The visiting Medical Officer was Dr. B. A. Oliviera, a Justice of the Peace, who, having preferred hospital to search work, gave his valuable services gratuitously during the whole period the hospital was in existence.

The nursing staff consisted of Sisters from the Bandora Convent and girls from the same institution who acted as assistant nurses; the Sisters were Sisters Juliana, Edith, Hilda, and Elizabeth, three of whom were generally present, and never less than two. The work done by these Sisters richly merits all that can be said in its favor, their untiring and self-denying devotion to alleviate the sufferings of the stricken, in the prosecution of which one of them, Sister Elizabeth, died a victim to the plague, won for them the confidence and lasting gratitude of a large community. The four girls from the Convent who assisted them worked well and steadily throughout. Of the two Hospital Assistants, Mr. Shaik Wazir fell ill of the plague, and for the greater part of the period of the hospital's existence, the other Assistant, Mr. Sullivan, carried on all the duties in a most able manner.

Of the eight ward orderlies, five belonged to the 8th, one to the 21st, and two to the 22nd Bombay Infantry, and all worked very satisfactorily.

Much trouble was experienced with the menial staff, many of whom, their services having been engaged with the greatest difficulty, left after working only for a short time, leaving no substitutes and causing the steady work of the hospital to be much retarded by their absence.

The hospital was used for all plague cases found in Mahim and Eastern Dharavi and all plague cases and suspects detained by the Medical Inspecting Staff at the Bandora-Mahim Causeway. It was opened on the 26th of March and closed on the 18th of May 1897, and in all there were 90 admissions, of whom 42 died (10 within 24 hours after admission), 41 recovered, and 7 were transferred in a convalescent condition to the Parel and Arthur Road Hospitals. In addition, a large number of suspects from the Bandora-Mahim Causeway were daily kept under observation, those only who developed plague having been included under the number admitted.

Summary of Report on Mahim Causeway Hospital.

Hospital opened	...	...	...	...	...	26-3-97
Hospital closed	...	...	...	...	...	18-5-97
Admissions	...	...	...	...	...	90
Recoveries	...	...	...	...	...	41
Deaths	...	...	...	...	...	42
Transferred convalescent	...	...	...	...	...	7

Staff.

Medical Officer ...	...	1	Ward Orderlies ...	...	8
Hospital Assistants*	...	2	Ramosees ...	...	2
Clerk ...	...	1	Cooks ...	...	3
Compounder ...	...	1	Dhobie ...	...	1
Sisters ...	...	3	Hospital Boy ...	...	1
Assistant Nurses ...	...	4	Sweepers ...	...	7

Worli Hospital.**GOVERNMENT HOSPITAL No. 18.**

Worli Hospital was built on that part of the Worli foreshore known as Cleveland Bunder. It contained two wards nominally of ten beds each, but capable of holding sixteen beds each if required to do so. It was also provided with the usual outdoor accommodation of a one-section hospital, including temporary quarters for nurses, a sub-divisional office, a block of rooms for the relatives of patients, and lines for a small detachment of infantry posted there for the purpose of providing men for search work, which proved useful as a hospital guard. The Staff consisted of one Medical-Officer, two nurses, one hospital assistant, one clerk, four ward orderlies, and the menial staff detailed in the attached tabular summary.

The Medical Officer was Dr. Dordi, who was also Sub-divisional Medical Officer of Worli Pakhadi. The nurses worked most thoroughly and conscientiously throughout. Great difficulty was experienced in obtaining and retaining menial servants on account of their awe of the disease and the distance from Bombay. One ward orderly, who misbehaved himself and created a disturbance, was sent back to his regiment. The rest of the staff worked faithfully and zealously and gave every satisfaction.

The hospital was used for plague cases and suspects from Worli and Worli Pakhadi. It was opened on the 1st of April and closed on the 20th of May 1897. There were 44 admissions, of whom 21 died (8 within 24 hours after admission), 11 recovered, and 12 were transferred to the Parel Hospital in a convalescent condition. It was decided to retain and strengthen this hospital after closing it, but the decision has since been abandoned, and the hospital is now in course of demolition. Matting walls and partitions are to be burnt, and the timber, bamboos, and jowlies retained for such uses as compensating the poor whose huts have been demolished, strengthening existing structures, and erecting monsoon shelters elsewhere.

Summary of Report on Worli Hospital.

Hospital opened ...	...	...	...	...	...	1-4-97
Hospital closed ...	...	...	...	...	...	20-5-97
Admissions ...	...	...	...	...	...	44
Recoveries ...	...	...	...	...	...	21
Deaths ...	...	...	...	...	...	11
Transferred convalescent ...	...	...	...	...	...	12

Staff.

Medical Officer ...	...	1	Ramosees	2
Hospital Assistant ...	...	1	Cooks ..	2
Clerk ...	...	1	Dhobie ..	1
Nurses ...	...	2	Sweepers	
Ward Orderlies...	...	4	Peon ..	

Report of Jullaia Mahommedan Hospital.

GOVERNMENT HOSPITAL No. 19.

This hospital opened on 10th April 1897; closed. Received 50 plague patients, of whom 22 died.

Hospital Establishment.

Hakim—Din Mahomed Bhaqui.

1 Compounder,
4 Ward-boys,
3 Ayahs, with
a menial staff of 7.

The hospital was conducted under a Hakim, and general supervision was exercised by Government Medical Officers; Government also defraying all expenses. The report and accompanying temperature charts sent in contain useful statistics clearly arranged.

It is impossible owing to the singular character of Hakim's medicines to give any account of the general treatment adopted. But the rate of mortality is satisfactorily low, being 44 or nearly 9 per cent. below the mean rate of all hospitals.

CASES.

Cases	... 50	} Of the 28 recoveries, the following were the symptoms :—
Recoveries...	28	
Deaths	... 22	

Glandular enlargement	...	...	...	...	19
High fever and vomiting only	...	...	...	...	8
Pneumonia	...	...	...	...	1

Proportion in respect of sex—

Males were 15 ; Females 12.

Proportion in respect of age—

Under 8 years	...	...	2	Between 25—30 years	...	...	6
Between 12—15 years	...	...	3	" 30—35 "	...	...	2
" 15—20 "	...	...	5	" 40—45 "	...	...	3
" 20—25 "	...	...	7				

Deaths, 22.—Of the 22 deaths, the following were the symptoms :—

Glandular enlargement	...	...	...	...	18
High fever only...	...	...	...	...	3
Pneumonia (no enlargement)	...	...	...	...	1

Proportion in respect to sex—

Males were 16 ; Females 6.

Proportion of Age.

Under 9 years	...	...	3	Between 30—35 years	...	...	0
Between 10—15 years	...	...	3	" 35—40 "	...	...	2
" 15—20 "	...	...	2	" 40—45 "	...	...	1
" 20—25 "	...	...	5	" 45—50 "	...	...	2
" 25—30 "	...	...	3	" 55—60 "	...	...	1

Times of Survival in Hospital.

12 hours 3	7 days 1
36 " 5	12 " 1
72 " 6	14 " 1
96 " 3	27* " 1
	47* " 1

* Died of exhaustion from excessive suppuration having survived attack 67 and 73 days.

Time of Survival after Attack.

Died—	Died—
2nd day of illness 2	8th day of illness
3rd " 3	9th " 1
4th " 8	12th " 1
5th " 1	28th " 1
6th " 1	67th " 1
7th " 1	73rd " 1

Survival after the fourth day of illness gives a distinct chance of recovery.

Sites of glandular enlargements in the 37 cases in which these were present.

Left Femoral 11	{ Recovery. 8
	{ Death ... 3
Right Femoral 11	{ Recovery. 5
	{ Death ... 6
Left Inguinal 6	{ Recovery. 4
	{ Death ... 2
Right Inguinal 2	{ Recovery. 1
	{ Death ... 1
Left Axillary 2	{ Recovery. 0
	{ Death ... 2
Right Axillary 3	{ Recovery. 0
	{ Death ... 3
Right Inguinal and Right Femoral. 1	{ Recovery. 0
	{ Death ... 1
Corvical (right) 1	{ Recovery. 1
	{ Death ... 0

Proportion of cases *attacked*, in relation to age. Of the 50 cases treated—

5 were between the ages of—	2—10
5 " " "	10—15
10 " " "	15—20
10 " " "	20—25
9 " " "	25—30
2 " " "	30—35
5 " " "	35—40
1 " " "	40—45
2 " " "	50—55
1 " " "	55—60

Of these, there were 31 males and 19 females.

Suppuration—

Of 37 cases of enlarged glands, 6 suppurated ...	{ Recovered... 4
	{ Died ... 2

Of 31 cases in which suppuration did not occur 15 recovered and 16 died.
Charts accompany the report.

Statistical Summary of Work done at the Arthur Road Hospital by Dr. Choksey, Medical Officer in Charge.

GOVERNMENT HOSPITAL No. 14.

1. The Municipal Hospital at Arthur Road which had been receiving plague cases since September 1896 came under the Plague Committee's administration on the 2nd March 1897. The following is a short statistical summary of the work done at the hospital from 2nd March to 30th June 1897.

2. *Grounds and Buildings.*—Accommodation for 115 patients existed, and an additional ward for 35 patients, then under construction, brought up the total accommodation to 150. Several structural alterations were made in the old sheds two of which were re-enclosed with new mat-frames and one with deal boarding. A verandah ran round each building and water connections which were in close proximity to the wards were removed to convenient places in the compound. Quarters and kitchens for the Nurses, Hospital Assistants, and Servants were constructed. The compound was kept scrupulously clean, all vegetation and undergrowth being constantly removed.

3. *Conservancy and Water-supply.*—The water-carriage system is in existence at the hospital; all excreta, &c., were disposed of through the drains after thorough disinfection with corrosive sublimate or carbolic acid. The water-supply is from the Vehar main. Several fresh connections were made to give additional water facilities to the hospital.

4. *Establishment.*—The establishment consisted of 1 Chief Medical Officer, 1 Assistant Medical Officer (during March and April), 3 hospital assistants, 1 compounder and clerk (for a part of the period only), 12 ward-boys, 3 ayahs, 3 cooks, 1 dispensary servant, 4 Police ramosees, 5 sweepers, and 1 mehtrani.

Nursing.—For the first two months the Sisters of All Saints nursed at the hospital. From 3 to 5 Sisters devoted their energies to the work, and they were assisted by two, and at times, three locally trained nurses, whose expenses were defrayed out of some moneys placed at the disposal of the Chief Medical Officer by two Hindu gentlemen—Messrs. Dwarkadass Dharamsey and Gordhandass Khatao. Subsequently English nurses were detailed to work at this hospital.

5. *Patients.*—On the 1st March 1897 there remained under treatment 98 patients suffering from bubonic plague; of those, 10 belonged to January admissions and 88 to February admissions. These cases will be accounted for in the report from September 1896 to February 1897 to be submitted hereafter to the Municipal Commissioner. The number of patients admitted during March, April, May, and June were 193, 60, 26, and 42 respectively; thus making a total of 321 for four months. The following table shows particulars and details:—

Months,	No. admitted.	Died within 24 hours.	Died within 48 hours.	Total deaths.	Recovered.	Percentage of total mortality.	Percentage of mortality excluding the deaths within first 24 hours.
March	193	54	34	130	63	67.35	54.28
April	60	17	10	34	26	56.66	39.53
May	26	7	1	10	16	38.46	15.78
June	42	2	1	6	36	14.28	10.00
Total ...	321	80	46	180	141	56.07	41.49

6. *Details of Patients.*—The following tables give the detailed particulars of the various castes and sexes of patients treated, with results :—

Hindus.

—				Total	Cured.	Died.	Percentage of mortality.
Males ...	...	...	...	172	71	101	58.72
Females	...	...	...	50	21	29	58.00
Children	...	...	...	33	17	16	48.48
Total ...				255	109	146	57.25

Mussulmans.

—				Total.	Cured.	Died.	Percentage of mortality.
Males ...	...	...	...	24	11	13	54.16
Females	...	...	...	4	3	1	25.00
Children	...	...	...	2	...	2	100.00
Total ...				30	14	16	53.33

Christians.

—				Total.	Cured.	Died.	Percentage of mortality.
Males ...	...	...	...	24	10	14	58.33
Females	...	...	...	5	3	2	40.00
Children	...	...	...	2	2	...	00.00
Total ...				31	15	16	51.61

Jews or Beni-Israel.

—				Total.	Cured.	Died.	Percentage for mortality.
Males ...	...	...	...	...	...	...	.....
Females	...	...	...	2	1	1	50.00
Children	...	...	...	2	1	1	50.00
Total ...				4	2	2	50.00

Parsees.

—				Total.	Cured.	Died.	Percentage of mortality.
Males ...	...	...	...	1	1	.....	.....
Females	...	...	...	.....	.....	.....	.....
Children	...	...	...	.....	.....	.....	.....
Total ...				1	1	.....	.....

On comparing the mortality rate according to the castes, and excluding Jews and Parsees (whose number is too small for comparison), it appears that Christians had the least mortality (51.61 per cent.), Mahomedans stand next with 53.33 per cent., and then Hindoos with 54.25 per cent. Amongst the latter the mortality in the males and females was almost equal, the children having a ten per cent. lower rate. The number of females and children amongst the former is not large enough for purposes of comparison.

7. *General Observations.*—Although the number of patients admitted during March and April was less than that of the previous three months, the type of the disease was much the same and the patients continued to be brought in when too far advanced for any treatment; in fact many of them were found dying and a few dead when removed from ambulances and vans. Thus, out of 193 patients admitted in March, more than a fourth (54) succumbed within the first 24 hours, a majority of the deaths taking place within the first few hours after admission, and 34 died within the following 24 hours, showing that, out of the total mortality (130), more than three-fifths of deaths occurred within 48 hours after admission. Similarly in April, 34 patients died out of 60 admitted. But out of this, half the mortality (17) occurred within 24 hours and a little more than a third within 48 hours—that is, *more than five-sixths of the total mortality was within 48 hours*. The type of cases admitted in May and June was certainly milder than in the previous months, and in June especially the cases were extremely anomalous and non-typical, entailing prolonged observation before they could be finally declared as plague. But even in May advanced and moribund cases were frequently admitted, and it is found that, out of the total mortality (10), 7 patients succumbed within 24 hours and 1 within 48 hours of admission—that is, *four-fifths of the total mortality occurred within 48 hours of admission*. The month of June reveals, however, a better state of affairs; 41 patients were admitted during this month (including 12 convalescents from other hospitals), and of these, 6 died; 2 deaths taking place within 24 and 1 within 48 hours of admission.

8. The above is a short statistical summary of the work done at the Arthur Road Hospital. A detailed report on the clinical aspects of the disease has been begun and will be submitted to the Municipal Commissioner for the City of Bombay.

9. *Voluntary Medical help* was rendered to me by Drs. Pilgaokar, Miss Manek Atmaram Tarkhad, and E. F. Underwood during this period, and I cannot sufficiently thank them all for their ready and willing co-operation.

10. *Conduct of the Establishment.*—The whole establishment has worked with praiseworthy zeal and devotion, and I would specially refer to the services of the late Dr. P. N. Danda, Assistant Medical Officer, who sacrificed his life in the discharge of the onerous duties of the post, as well as to the untiring zeal and devotion of Hospital Assistants, Samuel Samson, Pandharinath Bhowanrao, and Chunilal Chotalal, who were always ready and willing to work night or day. The subordinate establishment has also given me entire satisfaction.

11. *Nursing.*—No praise could be too high for the essentially Christian and humane work of the Sisters of All Saints, who have helped in nursing the patients during the most trying period of the epidemic, and whose noble, devoted, and self-sacrificing work will ever remain memorable and will add another bright chapter to their long history of other philanthropic work both in England and India. The Bombay trained nurses and probationers have worked to my entire satisfaction, and the way in which they discharged their onerous and distressing duties reflects great credit on Miss Atkinson of the Cama Hospital, under whom some of them had received, and were receiving, training. Miss Atkinson, Dr. Richardson, and Mr. Lloyd (of Calcutta) also helped in voluntary nursing, besides three English ladies Miss Morley, Miss Hale and Miss Kendall.

GOVERNMENT HOSPITAL No. 15.

Statistical and Clinical Record of Work done in the Parel Hospital (Government House) during the Period of its Existence from the 9th of February to the 26th of June 1897 by Surg.-Capt. Thomson, I.M.S.

Parel Plague Hospital was opened on 19th February 1897 and closed on 26th June 1897. During the period—upwards of four months—630 patients were admitted, and 70 were detained under observation for periods varying from one to three days, under suspicion of plague. Total number treated and detained were 700. Of the 630 admitted cases, 97 were suffering from other diseases, 229 were convalescents transferred from other plague hospitals, and 304 were acute plague cases.

This report is in reference to the 304 cases of undoubted plague that came under personal observation :—

Admitted...	304	} Of these 149 were men, 66 women, and 89 children (53 boys and 36 girls).
Recovered	...	...	108
Died	...	...	196
General mortality per cent.	64.5			

	Total.	Males.	Females.	Died.	Recovered.
European ...	1	.....	1	1	.....
Native Christians ...	66	38	28	44	22
Jews ...	4	1	3	3	1
Parsis ...	6	4	2	4	2
Mahomedans ...	16	14	2	8	8
Hindus ...	211	148	63	186	75
Total ...	304	205	99	196	108

Infants.	2-5 yrs.	5-10	10-20	20-30	30-40	40-50	50-60	60-70	70 & upwards.
		17	61	85	56	34	26	10	

The youngest patient was aged 10 months ; the eldest 96 years.

ANALYSIS OF MORTALITY.

Period after Admission to Hospital at which Death took place in 196 Cases.

Morbund (5 mts.—22 hrs.)	Days.																
	1st	2nd	3rd	4th	5th	6th	7th	8th	10th	13th	15th	16th	18th	21st	22nd	23rd	29th
66	17	38	8	24	10	9	5	6	3	1	2	1	1	1	1	1	1

Mortality.	Men.	Women.	Children.	Boys.	Girls.
64.5%	68.6%	71%	52.8%	42.5%	64.8%

Situation of Bubo.	Total.	Percentage	Males.	Females.	Died.	Re-covered.	Mortality per cent.
Right Axilla ...	47	15.5	30	17	34	13	72.4
Left Axilla ...	32	10.5	16	16	24	8	75
Right Femoral ...	59	19.6	45	14	33	26	56
Left Femoral ...	31	10.2	18	13	14	17	45.2
Right Inguinal ...	17	5.6	11	6	10	7	59
Left Inguinal ...	32	10.5	25	7	21	11	65.6
Right Cervical ...	8	2.6	7	1	6	2	75
Left Cervical ...	4	1.3	2	2	2	2	50
Right Parotid ...	7	2.3	3	4	5	2	71.4
Left Parotid ...	1	0.3	1	...	...	1	...
Multiple ...	24	7.9	15	9	14	10	58.3
No Buboes ...	42	13.8	29	13	33	9	78.6

- Right side*—150, of which 12 were multiple.
Left side—108, of which 8 were multiple.
Both sides—4, of which 4 were multiple.
In upper part of the body—109, of which 10 were multiple.
In lower part of the body—149, of which 10 were multiple.
In both upper and lower—4, of which 4 were multiple.

Distribution of Bubo.	Men.	Women.	Boys.	Girls.
Right Axilla ...	18	7	12	10
Left Axilla ...	9	14	7	2
Right Femoral ...	35	11	10	3
Left Femoral ...	13	7	5	6
Right Inguinal ...	5	2	6	4
Left Inguinal ...	17	6	8	1
Right Cervical ...	6	.....	1	1
Left Cervical ...	1	.....	1	2
Right Parotid ...	3	3	.....	1
Left Parotid ...	.....	.....	1	.....
Multiple ...	13	6	2	3
No Buboes ...	29	10	.....	3
Total ...	149	66	53	36

Buboes in unusual situation :—

Cases.

Right popliteal and right calf of leg (and left axilla) ...	1
Left popliteal (and left femoral) ...	1
Right brachial (and right axilla) ...	1
Right forearm ...	1
Scalp ...	2
Mammary gland ...	3

VARIETIES OF-PLAGUE.

Plague cases vary very much in severity, and some are so mild that it is only by the appearance of a bubo that one can know the patient is attacked by this specific disease.

(I) *Nervous*.—The most common form might be called nervous, from the presence of delirium, headache, cerebral vomiting, giddiness, sleeplessness, stupor, coma, and death by cardiac syncope from derangement of the functions of the central nervous system.

(II) *Pneumonic*.—This form is characterised by broncho-pneumonia or primary lobar pneumonia, cough, delirium, serous expectoration occasionally tinged yellow with blood, very few physical signs in the chest, expectoration containing large numbers of specific plague bacilli, absence of buboes, absence of dyspnoea, and of disturbance of the pulse; respiration ratio as in acute pneumonia, slight pain, irregular temperature, early cardiac failure and death.

In Parel 9 cases of this variety of plague were diagnosed as primary plague pneumonia and all of them died.

There were 19 instances of secondary pneumonia, of which 17 died and 2 recovered, and 4 had double broncho-pneumonia amongst the 17 that died.

(III) *Abdominal*.—This is characterised by early prostration, irregular remittent temperature, early abdominal distension, delirium, typhoid state (picking at bed-clothes, sinking down in the bed, involuntary passage of evacuations), simple diarrhoea of a thin, watery, and very offensive kind, aspect dull and stricken, absence of eruption, late appearance of bubo, and death by coma.

PREDISPOSING CAUSES OF PLAGUE.

Occupation.—Occupation in itself did not predispose to the disease. Most of the hospital patients were very poor labouring-class people. Dhobies are said to be particularly exempt from plague; yet seven were admitted. Fatigue, destitution, filth, poverty and overcrowding seemed to be the chief predisposing factors, and the horribly filthy condition of the person and clothing of most patients was indescribable.

The exciting cause, no doubt, as will be referred to under bacteriology, was the specific plague bacillus of Kitasato and Yersin.

Contagion.—There can be no doubt of the contagious nature of plague under certain insanitary conditions. When one case of plague came from a house, in 25 instances a second succeeding case came from the same house; in three instances a third, and in one instance a fourth case. How the first case arises it is impossible to state. It is remarkable that many instances of the death of rats in the house, infected room, or neigh-

bourhood were brought to notice by the voluntary declarations of the friends, and this circumstance is the more notable when the degree of intelligence and lethargic mental aptitude of the informants are considered. In 29 instances more than one case occurred in the same family. How the poison is transmitted is an indeterminable point, from the few opportunities of witnessing its actual spread in hospital. The disease is certainly most infectious in the acute stage. Once the temperature becomes normal, the risk of infection is over. No instance of the spread of the disease from convalescents to patients near them under observation or suffering from other diseases was met with. The body of a patient dead of plague does not seem to be capable of communicating the disease, except by inoculation, of which one example was seen.

One attack does not confer immunity from another, as one patient had a second and fatal attack, and one had a relapse. The second attack was in a woman aged 40; convalescent 18 days; attacked 27 days after the initial symptoms of the primary attack; and died five days afterwards. The primary attack lasted nine days, and the fatal one five days, and in the latter she developed a fresh bubo in a different site from the original one, had fever, delirium, stupor, coma, and unconsciousness. The general characters of an acute attack were present in the tongue, pulse, respiration, skin, eyes, intestinal canal, typhoid state, and mental condition. Her temperature had been normal 18 days when the fatal attack came on. The incubation period could be fixed at two days in one case, five in another, seven in another, and ten in another. In the inoculated example, due to a wound* incurred in the course of making a *post-mortem* examination (not a Parel Hospital case), the incubation period was within three days.

That the disease is not infectious in hospitals is a well-established fact from experience in the Parel Hospital. In upwards of 240 instances the friends of the patients attended their sick, and in 20 instances scarcely even left the bedside, and in not a single instance did the disease spread to the friends. Out of more than 140 attendants on the sick belonging to the hospital staff from time to time, only one sweeper was attacked, and he had been constantly helping in the *post-mortem* room and had a very mild attack with small axillary bubo. Temperature 100° F. at highest. He resumed his duties on the fifth day afterwards. In three cases amongst hospital orderlies other and special sources of contagion existed, very likely to lead to direct inoculation, and are therefore not considered instances of spread of the disease from mere attendance on the sick. One nurse belonging to another hospital, whose case is given in detail, was admitted.

The conclusion drawn is that one of the safest places during an epidemic is the ward of a sanitary plague hospital, something more than mere exposure to contagion being necessary to develop the disease—most probably overcrowding, destitution, deficient cubic space, ventilation, and sun-light, and a filthy and general insanitary condition of person, clothing, habitation, and its surroundings.

* The late Dr. Manser.

Further specific proof of the non-contagiousness of plague in hospital was furnished by one instance in which a mother ill with the disease suckled her infant and it escaped ; by one instance in which an infant with plague was nourished on the mother's milk and she was not attacked ; and by one instance in which a brother slept in the same bed with his stricken brother and did not contract the disease from him.

DIAGNOSIS OF PLAGUE.

In an epidemic the diagnosis of plague is to some extent aided by presupposition. In cases in which no buboes can be felt—comprising 13 to 14 per cent. of those observed at Parel—the diagnosis must depend on the general symptoms and signs ; and in cases likely to prove fatal, by confirmatory bacteriological evidences. At other times some non-bubonic cases are likely to escape detection.

In those cases the buboes cannot be got at, if in all cases they exist, for bacteriological examination, and mere blood cultures generally failed to demonstrate plague bacilli, even in undoubted bubonic plague patients who afterwards recovered. The following points guide one in arriving at a diagnosis :—

1. Character of the tongue.
2. High temperature, with hot *dry* skin.
3. Injection of conjunctivæ usually met with.
4. Delirium, sleeplessness, headache, vomiting.
5. Sudden onset without premonitory symptoms.
6. Dull, heavy, apathetic look.
7. Pulse full, soft, compressible and dicrotic.
8. Marked mental hebetude and lethargy.

All doubt is removed on the appearance of the bubo with some or most of the preceding symptoms and signs ; and no one sign or symptom can be relied on as pathognomic of plague, but the general clinical phenomena must be viewed together and the diagnosis arrived at from the patient's condition as a whole.

The diseases most liable to be mistaken for plague, judging by those suspected cases sent into hospital, are ague, remittent fever, syphilis, pneumonia, epilepsy, cerebral apoplexy, uræmic coma from advanced kidney disease, ulcer with sympathetic (simple) inflammation of lymph glands, and diarrhœa, debility, marasmus, and phthisis.

RATE OF MORTALITY.

1. Age did not seem to influence the rate of mortality.
2. *Sex*.—The female sex showed an excess of mortality ; 71 per cent. of the females over 18 years of age died, whereas the men above that age showed a death-rate of 68·6 per cent. of those attacked ; and female children gave 64·3 per cent. of deaths to attacks as against 42·5 per cent. in boys.

No diminution in mortality or virulence was apparent during the decline of the recent epidemic, and some of the cases admitted in the last week were as virulent and fatal as at any period of the epidemic.

3. *Situation of Buboes.*—Under this head it is a remarkable fact that cases without palpable buboes were most fatal, averaging 78·6 per cent. Many of such cases died early of convulsions, coma, and syncope, overwhelmed by toxic products suddenly attacking the great nerve centres, as it were, before there was time for an inflamed gland to arise.

The next most fatal were L axillary and R cervical in the same proportions, then R axillary and R parotid in nearly the same ratio, next came inguinal, and next femoral; and multiple seemed to be least fatal.

Buboes on the R side had 66·7 per cent. mortality.

"	"	L	"	58·3	"	"
"	in the Upper part of the body			69·3	per cent. mortality.	
	Lower			57·2		

The nearer the head the more fatal the case, and those with buboes in the neck, and especially in its anterior aspect were very fatal.

4. *Race.*—

(a) Native Christians had a mortality of 75 per cent. admissions.

In males 63·2 per cent. died, and in females 71·4 per cent.

(b) Jews had a mortality of 75 per cent. admissions, but only 4 cases in all.

(c) Parsis had a mortality of 75 per cent. admissions; but only 6 cases in all.

(d) Mahomedans had a mortality of 50 per cent. exactly.

(e) Hindus had a mortality of 64·5 per cent.; and males amongst Hindus died at the rate of 65·5 per cent.; and females of 65·1 per cent.

The general excess of female mortality was due to the number of pregnant females who aborted; and to the influence of the catamenial discharge; and the disproportionate number of deaths from convulsions amongst young female children who showed an excess of mortality as compared with boys in the proportion of 64·3 to 42·5 per cent.

In persons who are very fat the prognosis is unfavourable.

Mental depression and fatigue, and previous privation add to the mortality.

The following are bad omens:—Pulse over 120; respirations over 30; sleeplessness lasting several days; early and violent delirium; great prostration; carphology, subultus; twitchings and convulsions; hiccough, "typhoid state"; malaric symptoms; presence of complications, especially broncho-pneumonia; hypostatic congestion of the lungs; laryngitis; dysentery; meningitis and pneumonia.

The only favourable prognostic that can be relied on is the absence of the unfavourable symptoms noted above, and the fact that the patient has come early under treatment and is kept lying down, until his temperature has been normal, four days. Most patients who survive eight days without developing complications recover.

Free excretion of urea and uric acid and the absence of albumen, blood, and renal casts in the urine are favorable signs, and a return to the normal quantity secreted and the presence of chlorides, one of the first signs of amendment.

A change in the patient's manner and countenance often heralds his recovery; the expression is less stupid, and he becomes rational, takes notice and the conjunctivæ become less injected.

Many cases died who appeared to be recovering, and on the other hand some recovered whose death appeared inevitable.

Although the general mortality was 64·5 per cent., it must be pointed out that 66 were moribund on admission, 17 died during their first day in hospital and 38 during their second day. Excluding those 121 deaths under 48 hours in hospital, the rate of mortality was 41 per cent. of cases treated.

By further excluding cases treated by M. Yersin's serum, which are dealt with separately, the mortality of cases under hospital treatment was only 30·8 per cent. of admissions who lived over 48 hours in hospital.

Finally, there can be no doubt that the disease is a very malignant one, many cases dying suddenly before reaching hospital even when compulsory segregation was enforced.

CLINICAL DESCRIPTION.

The onset of an attack of plague is usually very sudden, the patient being struck down with the following premonitory symptoms. He is seized with rigor or a feeling of chilliness, followed by frontal headache, nausea and vomiting, lassitude and disinclination for exertion. The vomiting is of cerebral origin, bilious in character, and may be frequently repeated without bringing any relief to the patient's feeling of illness.

The tongue is large, pale (often teeth-indented) and evenly coated first with a thin white, and later with a yellowish brown fur.

This fur is confined to the dorsum of the tongue, the tip and edges and under-part of the tongue being bright red and clean, and the amount of furring increases towards the back of the organ.

Thirst is generally complained of, but the appetite is good and the taste not perverted. The bowels in natives have been invariably constipated, and the urine, scanty, high-colored and febrile in character, with some albumen and casts.

The pulse is over 100, full, soft, and bounding, at an early stage of the disease, becoming later, frequent, small, markedly dirotic, and very compressible, and finally anacrotic, running, and imperceptible and rarely irregular or intermittent.

The respirations are accelerated, averaging over 30 per minute, and there may be slight cough.

The face is suffused and muddy ; the conjunctivæ injected and the eyes watery, and the general expression dull, heavy, and stupid. Usually there is giddiness, restlessness, and loss of sleep, or snatches of sleep broken by slight delirium and confusion of the memory and intellect. The delirium varies in character. It may be acute, wild, raving, or wild and busy, resembling *delirium tremens*. In the former the patient shouts, talks incoherently, is violent, and tosses about so that it is with difficulty he can be restrained or kept in bed.

Delirium of a wild, violent nature is rapidly followed by collapse, and if accompanied with refusal to take medicine, food, and stimulants, usually ends in death at an early period. Sometimes the delirium is never acute, confined to slight incoherence between sleeping and waking ; and many fatal cases of undoubted plague never develop delirium.

Generally along with the delirium there is sleeplessness, and the patient's attention can be momentarily arrested by speaking loudly to him, but he soon lapses into incoherent muttering.

His cerebation seems to be at a low level, and there is a want of power to concentrate the thoughts for any length of time on any one subject, so that he soon becomes wearied, fails to keep up a connected conversation, and only partially utters replies to questions ; in fact, there is a general subjection of the mental faculties : hebetude and lethargy.

The symptoms of nervous excitement may last for days—indeed in one case they lasted nearly continuously for days and became more marked towards evening and in the night-time,—or may pass into nervous depression and stupor. The prostration is now marked, the patient lying in the dorsal decubitus, sighing, muttering slightly, or still and motionless, as if overwhelmed with some toxic cerebral poison, and utterly indifferent to all surroundings.

Tremors, subultus, tossing of the arms aimlessly before the face and picking at the bed clothes supervene. The eyes are firmly closed, the pupils contracted, the conjunctivæ markedly injected, and the countenance stupid and vacant; deafness is also generally present. The tongue becomes dry, brownish, and rough in two lines on each side of the central *râphè*, with thick whitey-brown fur, chipping in flakes, which leave raw red patches often showing fissures ; it is protruded slowly and with difficulty, and the patient often forgets to withdraw it for a time until loudly spoken to. It is rarely tremulous. *Sordes* collect on the teeth and

lips, and constipation continues. In this state the patient may continue for some hours or several days, and even recover. But usually the stupor passes into fatal coma, or the pulse becomes frequent (140—160), small, weak, or scarcely perceptible, the surface cold, especially the extremities, and the case ends fatally in coma and syncope. On the other hand there may be an amendment, and the patient returns to consciousness and life. He is extremely debilitated and at first bewildered, but soon gets in touch with his surroundings. The pulse may become normal and the temperature fall, generally by lysis, which is by far the more favourable termination in this disease, or rarely by exisis; the tongue becomes clean and moist; and without any critical accompaniment, such as diarrhoea, perspiration, or increased flow of urine, the patient may rapidly regain his senses and no permanent blot remain.

It must be remembered that the disease presents great varieties, from the most wild and hardly recognizable forms to the most severe, and one can seldom tell from the symptoms alone whether a given case is going to turn out favourably or fatally. In mild cases the pulse may never go above 100, or the temperature above 101, and slight (or no) confusion of the intellect, headache, and sleeplessness be the only symptoms of cerebral derangement. The diagnosis can only be made by the discovery of an inflamed and perhaps only slightly enlarged lymphatic gland, and by a bacteriological examination microscopically, and by cultivation of the extracted matter from this gland.

PRINCIPAL SYMPTOMS OF PLAGUE.

Physiognomy.—The physiognomy of a plague patient, when this phenomenon is present, as was found in about half the cases at Parel, is peculiar and striking and will often direct attention to the nature of the disease from which he is suffering. The countenance is dull, vacant, and anxious, and the eyelids and mouth are kept half open. The patient has a furtive look, rarely meets his eyelids in winking, and seldom performs that act; gazes about him vacantly and does not seem to care to talk or to notice persons or things about him. In addition, the conjunctivæ are injected, often markedly so: the eyes suffused and the pupils usually normal.

The Temperature.—The temperature in plague is elevated from a very early period of the disease. Some cases seen within ten hours of the initial rigor showed a rise up to 103·4° F., and no case has been met with in which symptoms of plague were present without an accompanying rise of temperature, so that it may be defined as a febrile disease. The temperature is of a remittent type, with slight ranges of 1 or 2 degrees, but sometimes sudden rises up to 107·4° F. even, and there is usually an evening exacerbation noticeable.

The maximum is attained on the second or third day, and in the natural uncomplicated course of the disease there is usually a slight remission from the fifth to the seventh day. This remission was noted in some of the

earliest cases uninfluenced by antipyretic treatment, and seems peculiar to plague. The temperature can be only very temporarily influenced by drugs, and antifebrin and phenacetin were employed in a few cases on trial, but not with encouraging results, so that their use was abandoned. Tepid sponging repeated every time the temperature touched 103.5° F., and the application of the ice-bag and administration of diaphoretic mixture with stimulants came to be looked upon with most favor in combating this symptom.

A fall of temperature by lysis from the fifth to seventh day is a favorable symptom; and very often the use of some medicament, or resort to one of the methods of surgical interference with the local expression of the disease, by excising or injecting the inflamed gland, has been credited with an unwarrantable influence on the temperature curve. A decided rise of the temperature during the course of the disease after the seventh day is mostly due to the advent of some complication, such as secondary broncho-pneumonia, boils, lymphangitis, or septicæmia, and indicates prolonged convalescence or an unfavorable issue.

Marked elevation of temperature does not of itself mean an abnormally severe or necessarily fatal case, and in some cases the temperature has reached 106.4° F., and yet the patient has recovered. On the other hand cases may be severe and even fatal, mostly from toxic nervous symptoms, when the temperature has never reached 103° F. In fatal cases the temperature has ranged as high as 107° F. at, and even after, death. The average of cases ranged between 102° F. to 105° F., and the lowest had 100° F. only. As a rule, the T is 102—105; P 110—120; R 20—30.

The Skin.—The skin is almost invariably dry and hot; yet very rarely perspiration was noted on the forehead or chest, and in this respect the disease presents a marked contrast to the freely perspiring and moist skin of ague and remittent fever, which have frequently been sent in to hospital under suspicion of being plague.

An eruption on the skin of any distinctive character, although frequently looked for, was not found. In a few cases, at most, fugitive erythematous, or urticarial rashes, or mosquito, or lichen tropicus were discovered. *Sudamina* were rarely seen, and *purpura* spots, *vibices*, and desquamation conspicuous by their absence.

In a small number of instances abrasions, and in five cases a distinct vesicle, were found on the extremity or part of the body in which the primary bubo was situated. The lymphatics, however, leading from those vesicles never were found inflamed. In all five cases the contents of the vesicles, when examined microscopically and by bacteriological cultivation, yielded positive evidence of the presence of the bacillus of plague. From such absolutely positive results one may state that the source of infection has been by inoculation through the skin, perhaps by an abrasion or small cut, but that this is the invariable and only mode by which the bacillus gains an entrance is open to grave doubt. The

lymphatic gland in anatomical connection with the vesicle was inflamed and tender in each of those cases, and was the only one affected as far as could be made out.

The occurrence of boils was frequently noted as a sequela, and true carbuncles were never met with in any of the Parel patients. An acute necrosis of the skin, sub-cutaneous tissue, and gland occurred in three instances, but was not of such clinical features as to arouse the idea of carbuncle in the mind of the observers. It is to be further noted that in every such instance the patient or his friends had applied some irritant over the gland, usually a mixture of marking-nut, chunam and ghoor (molasses).

That carbuncles are met with in plague, one can hardly doubt; but the experience of the Parel cases would lead one to conclude that their appearance is not characteristic or, by any means, a diagnostic of plague. That they were carefully looked out for at Parel with the assistance of other investigators precludes the idea that their presence could have been overlooked.

In some cases a peculiar earthy, cellar-like odour was detectable from the patients' skin and breath. It is a remarkable fact that this odour was quite familiar to the nurses, and noted independently by one of the very intelligent nursing sisters, who thought it was confined to fatal cases. The smell was quite distinct from that due to involuntary passing of the motions or urine in the bed, and was observed in some cases in which the patient had perfect control over his evacuations. Generally, cases ending in fatal septicæmia evolved this odour from the skin and breath, but a few patients in which its presence was unmistakable, recovered.

The Pulse.—As a rule, the pulse is over 100 per minute, and a slow pulse was not met with in a single case of plague. It may reach 120 to 140, or even 170, per minute during the course of the disease. Seen early in the disease, the patient will be found to have a frequent (110 to 120), full, bounding, soft, and compressible pulse which is markedly dicrotic and presents a want of vehemence in the stroke. A gradual fall in the frequency of the pulse-rate is a favorable sign, and a great rise after a fall means some complication supervening. There does not appear to be any definite pulse-respiration ratio, although at first both are elevated, and finally it becomes very rapid and often imperceptible before death.

A marked character of the pulse, on which some interesting observation were made both during the fever and in convalescence, was the influence of posture on its frequency and force. The frequency became increased by as many as 20 to 32 beats per minute, and it became small, weak, almost thready and irregular (and all this seemed to be due to the great prostration of the nervous system) when the patient was helped gently and carefully to sit up. The heart's sounds were constantly found to be normal, although the impulse was diffused and strong. No murmurs were detected in any patient at Parel at any stage of the

malady, and the heart at the *post mortem* showed no valvular lesions or visible alteration of its musculature. Softening of the structures was conspicuous by its absence, and yet the alarming suddenness of death in patients convalescing from an attack of plague seemed to foreshadow such pathological change. In all probability the syncope met with in such cases is secondary to toxic degeneration of the central nervous mechanism, and is due to sudden vaso-motor paralysis. No fact in the clinical phenomena of plague remains more indelibly impressed on the mind than the extremely frequent and alarmingly sudden and unexpected death of patients who are apparently well on the road to recovery. The pulse may be normal in frequency and force, the temperature normal for some days, and yet some slight exertion, such as sitting up prematurely in bed, may lead to fatal syncope, and nothing was found in two such cases in the heart itself to account for the result.

Respiratory System.—The respiration usually exceeds 25 in the beginning of an ordinary case, and that without any lung complication, and often rises to 30 or even 48 up till 60 per minute. In grave cases it is hurried, sighing, and often irregular, and sometimes the *alæ nasi* can be seen to take part in the respiratory act. When there is coma the breathing may be blowing, with the mouth closed, and the cheeks puffing, and the respirations irregular.

Hypostatic congestion of the lungs is met with as a complication of plague and is usual in fatal cases ; congestion taking place in the most dependent parts of the lungs as the power of the circulation wanes. When this supervenes, the respirations mount up to 30 or 40 and up to 60 or upwards per minute, and are hurried and laboured, whilst at the same time the temperature may be nearly normal, and cold extremities and stupor, deepening into coma, close the scene. In this condition there may be only slight, if any, cough or expectoration, and physical examination alone reveals to the physician the dangerous condition of the patient. This condition demands the free exhibition of diffusible stimulants and strychnine with tincture of *strophanthus* and carbonate of ammonia, on which most reliance can be placed.

Digestive System.—The tongue from the very first is coated with a whitish, thin, silvery fur, confined to the dorsum and increasing in depth towards the root of the organ and most marked on each side of the *râphè*, while the underneath part and tip and edges of the tongue are red and clean, with prominent fungiform papillæ and the whole tongue moist. The fur becomes yellow, then brown and cracked, and falling off in flakes which expose a clean, raw, red, irritable-looking surface. In no case did the tongue appear black, or contracted into a ball, or bleeding and ulcerated, or fissured. The amount of furring showed no relation to the severity of the case. During convalescence the tongue becomes clean at the sides, and the fur slowly and gradually disappears. In fatal cases the tongue is tremulous, protruded with difficulty, and dry and flaky.

In severe cases brown *sordes* collect upon the lips and teeth, the patient survives some days, and fatal cases towards the end of the first week usually show such phenomena. The gums may be soft and spongy, rarely ulcerated, and hemorrhages were never seen.

The appetite is not impaired ; indeed the patient can take food fairly well throughout. Of course, cases with coma, stupor, and wild delirium refuse food, and do badly as a rule. Convalescence is not ushered in, therefore, with any improvement in the appetite or ravenous craving for food. Thirst is present in nearly all cases, but is rarely excessive ; and sometimes most thirst was complained of in cases of a mild type and without high temperature or excessive secretion of wine or sweat. It is one of the earliest symptoms of the disease, and the patient often mentions it as part of the initial history of the attack. Sometimes dysphagia is present, and this was noted especially in cases where the glands in the anterior triangle of the neck were enlarged and surrounded with a good deal of infiltration and œdema. Such cases rapidly proved fatal, and œdema of the glottis and marked inflammation of the pharynx and trachea were found in *post mortem*.

Nausea and vomiting are common early symptoms. One or other or both were present in 60 per cent. of the acute cases admitted. The vomited matter was bilious in character, frequently repeated, affording no relief, and occurring independently of the injection of food, medicines, or stimulants. It was undoubtedly of cerebral origin, due probably to the action of toxins on the nervous centres. Sometimes vomiting persisted, and was a troublesome symptom even during convalescence. In its treatment camphorodyne, bromide of ammonium, hydrocyanic acid and ice (to suck) were found useful.

Tympanitis was not a frequent symptom. In puerperal cases, which aborted, it was very marked. The abdomen is not distended, but generally soft, flat, or flaccid. In the puerperal cases it was associated with tenderness and cerebral depression and prostration, but not with diarrhoea. Gurgling was only detected in one case, and that was of the abdominal or typhoid type, and in a European, and was accompanied by frequent, very offensive, acid motions, and was general over the abdomen and not localized in the right iliac fossa. Abdominal pain was seldom present and scarcely ever complained of, and tenderness only occasionally noticed. The liver and spleen were in some cases found enlarged, but more frequently those organs could not be palpated clinically. The spleen is more generally found enlarged than the liver, and in the majority of the *post mortems* this was apparent.

Constipation, in natives, was invariably found to prevail in the early stage of the disease ; indeed diarrhoea was only present in one case of enteric type in a European. The constipation was so obstinate as to require a calomel and jalap purgative in most instances, and this became part of the routine hospital treatment. Many cases, fatal or

otherwise, ran their course without diarrhoea supervening. During convalescence diarrhoea sometimes came on as a sequela, or associated and followed by dysentery. The motions in plague are usually acid and were not, in a single instance, found to contain bacilli although carefully looked for, both before and after the administration of purgatives and at different intervals by the members of the German Plague Commission.

The Urine.—The urine diminished in quantity, and in three severe cases it was completely suppressed. It is usually reddish-brown or darker than normal in the early stage; and, in convalescence, the color becomes pale and limpid and the quantity increased. The re-action was acid, and the specific gravity from 1,015 to 1,030 in 30 acute cases specially examined, and the average of urea, uric acid, and chlorides diminished, and albumen $\frac{1}{20}$ to $\frac{1}{10}$ present in 33 per cent. of the cases. Tube casts were found in the sediment of 15 per cent. of the cases examined in the forms of granular epithelial and hyaline plugs. Albumen was tested for by heat and nitric acid—the ordinary clinical tests—and during the period extending from the third to the tenth day of the disease; and was not found during convalescence. Bile pigments were generally present.

The urine, with one exception and that a fatal case, yielded negative bacteriological results, and in no case was blood passed in or with the urine.

In only three cases was retention of urine present, necessitating the use of the catheter; and all of them had grave cerebral symptoms and ended fatally.

Nervous Symptoms.—One of the earliest and most constant symptoms of plague is headache. It was found at some stage, in 94 per cent. of acute cases, was severe; and the patient complained of it during the first few days in the majority of such cases. Headache is most often frontal or temporal in seat, rarely vertical or occipital, and is of a dull heavy character; sometimes intense, or ill-defined and throbbing, and in still fewer cases it may be absent.

Giddiness in most cases is complained of as a very early symptom along with headache, and prevents the patient from sitting up, walking about, or attending to his duties. It is very rarely, indeed, that pains in the loins, back, or limbs are met with, so that the disease can hardly be simulated by small-pox back-ache.

Delirium and obscuration of the mental faculties are almost invariably met with at some period in this disease, although mild cases are met with which never become delirious or show mental confusion. The character and amount of delirium vary greatly, and present no relation to the severity of the attack. Of 100 consecutive cases mental aberration or delirium was present in 74 at some period. The patient is apathetic, hesitating, stupid, and his mental faculties blunted and confused, whilst he appears irritable and does not like to be disturbed. The delirium appears early, often at the very beginning of the disease, and is most marked at night throughout. Sometimes patients appear wakeful and delirious by

night, and stupid, drowsy, and comatose by day. If the patient is about to recover, delirium ceases. Some cases develop late maniacal delirium during convalescence, refuse food, and die of marasmus in spite of forced feeding. When delirium is present, headache is not a prominent symptom, or else the patient is too mentally confused to complain of it.

Most commonly the delirium is of a low muttering type; when left to himself the patient is restless, and irritable, and, when roused, answers in a slow, hesitating, rambling, and incoherent manner, and with great effort apparently.

Some patients are fidgety, tossing their limbs about, drawing up their leg and shooting it out fully extended again, move about in bed, try to get up without definite object, laugh, sigh, moan, and have busy delirium like the *delirium tremens* of the drunkard.

Occasionally there is wild, fierce, maniacal *delirium*. The patient is sleepless, rolls his head about, shouts, refuses all nourishment, and is restrained with great difficulty. The muscular power of such a patient may be surprising, and one young girl required considerable strength to keep her in bed. This form of *delirium* soon ends in collapse, profound muscular and nervous prostration and death. This wild form of *delirium* was mostly seen in young and strongly-built muscular patients, and the few who recovered from such a state remembered nothing of it, the mind appearing to remain a perfect blank.

Sleeplessness was noted in 90 per cent. of acute cases, and is one of the earliest symptoms, and may be present for several days and nights in succession. It is a favorable sign when a patient sleeps well and naturally. Somnolence, apart from stupor and coma, was not met with; and coma-vigil not observed.

Prostration and loss of muscular tone are early developed, but these would appear to depend on implication of the nerve centres; and in some cases the patient has voluntarily walked some distance to the hospital, to die in a day or two of extreme nervous prostration.

As a rule, prostration increases with the advance of the disease, and is marked in those who have had *delirium* and great excitement and struggling when unconscious. Prostration may develop quite suddenly and prove rapidly fatal in persons who, but an hour before, were apparently quite on the way to ultimate recovery. Should a patient recover from such a prostrate condition, there are great lassitude, weakness, and want of energy for a long time, following it. Along with the prostration there is usually dorsal decubitus.

The general absence of involuntary discharge of faeces and urine and the only occasional retention of urine show that muscular paralysis does not often exist; whilst conjunctivitis and ulceration of the cornea from inability to close the eyelids point to nervous centres poisoned by the products of the specific bacillus.

Sub-sultus tendinum and spasmodic contractions of the hands, arms, and face are seen in severe cases, and in one case the spasms succeeded each other at the rate of 18 to 20 per minute and affected the flexors and adductors of both upper extremities. In this case double axillary buboes appeared within the first 24 hours simultaneously.

Convulsions, in very young children, seemed to take the place of *delirium*, and the little patients in four instances expired apparently from the very severity of the convulsions, overwhelmed with acute toxæmia before an inflamed gland had developed.

Other forms of spasmodic movements were seen in some fatal cases in the fumbling at the bed-clothes and aimless tossing of the arms; and, in a few patients, hiccough, from which few patients recovered. Convulsions usually ended in coma and death, and in three cases the convulsions were noted during the death agony.

The marked prominence of nervous symptoms shows that the brunt of the disease falls on the nerve centres, and that the toxins absorbed from the primarily inflamed gland into the blood, or, in pneumonic cases, formed directly in the blood, act injuriously by a sort of selective affinity on the nervous system. The great frequency of nervous sequelæ confirms this to demonstration.

SPECIAL SENSES.

Eyes.—The conjunctivæ are generally injected, and in more than half the acute cases were markedly so, at the beginning of the disease, and the eyes suffused. There may be lashes of inflamed and engorged vessels often noticed at the two canthi, especially where the pressure of the lids is wanting. This injection of the ocular conjunctivæ is a valuable diagnostic sign as it is met with early, and generally in cases in which a characteristic bubo has not appeared.

Acute conjunctivitis was seen in five cases, hypopyon in one case, and ecchymosis in two cases, whilst ulceration, panophthalmitis, and chemosis were among the sequelæ which developed in seven convalescents.

Photophobia did not appear to be present, and patients never complained of it.

The pupils were most frequently normal, next most frequently contracted, and very seldom dilated or unequal.

Ears.—Deafness is generally present; as the patient, when addressed in the ordinary tone of voice, will often ask to have the question repeated, and even then only understands when he is spoken to loudly and distinctly.

Patients who had not been getting quinine appeared to suffer, and syringing of the ears did not lessen the deafness: of which the explanation is difficult. The dulness of the mental faculties may be the cause of this apparent deafness.

Otorrhoea did not occur in a single case, nor was inflammation of the meatus or membrane tympani seen.

Smell.—Parosmia and Epistaxis were never seen at any time.

Taste.—The sense of taste is not affected, and patients usually partake of whatever is given them with apparent relish. Very occasionally a patient complained of an acid bitter taste in the mouth; but none ever mentioned a bad taste.

Sensibility and Touch.—Perversions of the sense of touch, were never noted.

COMPLICATIONS AND SEQUELÆ OF PLAGUE.

Many cases develop complications and sequelæ which prolong the course of the primary fever and delay convalescence, and ultimately turn the chances of recovery against the patient and cause his death.

The most frequent complication was broncho-pneumonia which developed in a course of the disease in 19 cases; 17 ending fatally. The disease began insidiously, and between the 4th and 8th day; cough and slight expectoration being present. Pain in the chest is seldom complained of. Very often a rise in the temperature and quickened breathing were the first indications of its onset.

Of the 19 cases, 12 were men, 5 women and 2 children. The physical signs were confined to a small area, and slight. Bronchitis was only noticed in 2 cases.

Pneumonia as a primary affection was seen in 9 cases. In none of the primary Pneumonia cases were tangible buboes found. The disease began as pneumonia, but the temperature was not very high, and only a few scattered patches in one lobe generally were detectable on auscultation. Expectoration was sero-mucoid, scanty, and occasionally tinged with blood. The sputum was rich in bacilli and yielded pure cultures by growth on agar-agar. All primary pneumonia cases at Parel hospital ended fatally.

One case developed left Pneumo-thorax which proved fatal 37 days after admission, and this was the latest day on which an acute case died in Parel hospital. Pleurisy is not a common complication and is latent, no sharp pain being complained of, and the effused fluid quickly absorbed, never becoming purulent in the 2 cases noted; these both ended in recovery.

Phthisis came on in 2 cases during convalescence and carried off the patients. Rapid emaciation and debility, profuse sweating, purulent expectoration and hectic fever, but no hæmoptysis, were the prominent symptoms.

Laryngitis occurred in 5 cases and proved to be a serious complication. In all instances a bubo in the anterior part of the neck, or beneath the sterno-mastoid or in the parotid region, accompanied or preceded

the laryngitis and all ended fatally by cedema of the glottis and enormous cedema of the subcutaneous cellular tissue of the neck below the jaw and in front of the throat. In most cases this swelling came on rapidly and changed—by partially obscuring—the features of the sufferer.

DISEASES OF THE NERVOUS SYSTEM.

Meningitis.—True meningitis came under notice in 2 cases and both ended fatally. Inflammation of the membranes of the brain was discovered at the *post-mortems*.

The frequent presence of symptoms of cerebral disturbance and the rarity of true meningeal inflammation would seem to prove that the symptoms depend on toxæmia.

Imbecility and mania are rarely developed after plague. Only two convalescents showed signs of imbecility in the form of delirium, refusal to take food, marasmus, dementia and death; and one patient transferred from another hospital had mania as a late sequela.

As a rule the mental faculties are completely restored after the first few days of convalescence; so that organic brain lesion must be rare.

There was no fever or headache accompanying the imbecility; but anæmia and mental depression.

Tonics, stimulants, and sedatives to induce sleep—preferably opium—benefited such cases.

Paralysis.—Paralysis is frequently seen as a sequela of plague. In Parel 7 patients developed Aphasia in from 10 days to 30 days after the beginning of convalescence. All recovered speech before being discharged; and the longest period during which a patient remained aphasic was one month. Recovery was gradual but complete in every instance.

Hemiplegia occurred in 5 patients and they all recovered muscular power except one who was transferred after 93 days in hospital to a house for the indigent poor. Paraplegia was seen in 3 patients during convalescence; facial paralysis twice, and local paralysis, affecting the upper arm on one side, in two cases. All recovered.

Spastic paraplegia developed in one man 2 months after convalescence and he ultimately was discharged cured.

In all 20 patients had paralysis of different sorts, and all recovered; so that gross lesions of the nerve centres could hardly have been the exciting cause. One is rather inclined to attribute such sequelæ to toxins acting on the nerve centres or nuclei of origin of the affected nerves.

DISEASES OF THE DIGESTIVE SYSTEM.

Pharyngitis.—Inflammation of the pharynx causing difficulty in swallowing, interfering with nutrition, and leading to cedema glottidis was a marked complication twice.

Ulceration of the mucous lining of the palate was seen once.

Hæmatemesis was never observed nor was melaena met with, and considering the engorged state of the gastro-epiploic vessels met with after death, and the numerous gastric and intestinal petechiæ, this seems an unexpected clinical record.

Diarrhœa was only met with in one case of the abdominal enteric type, in a European, accompanied with tympanitis, frequent foetid watery motions, and ending fatally on the 6th day of the disease.

Dysentery, as a sequela, was marked in 12 cases leading to great anæmia, profound debility, and tardy convalescence, and death in 3 instances.

Jaundice was never met with in Parel hospital.

Diseases of the urinary organs.—Albuminuria was noted in 50 per cent. of the cases examined, and tube casts in 25 per cent. of those. Hæmaturia occurred only once, associated with suppression of urine, uræmia, and death. Cystitis was never met with.

Complications of menstruation and the puerperal state.—Menstruation is often induced by an attack of plague and is occasionally profuse. In seven females this state was set up by their developing plague. Five of them died and two recovered. In one case menstruation had been absent some 6 months, and was brought on twice during the life of the patient in hospital, and ultimately this patient succumbed. The impression remains on one's mind that the presence of the catamenia during the acute stage of plague is a complication of grave omen.

Pregnancy.—Four pregnant women were admitted for plague. Every one of them aborted and died. Three were at the 6th month and one at the 4th month of pregnancy. All the fœtus were dead and in two instances their skin was desquamating. Three of the fœtus were examined *post-mortem*, and hæmorrhagic petechiæ were found in the cerebral membranes, stomach intestines, and elsewhere, but no plague bacilli could be demonstrated anywhere in their bodies by microscopic examination or bacteriological culture methods. It would appear that the toxic products in the blood of the mother can give an entrance into the tissues of the fœtus and cause its death and discharge from the uterus prematurely. Abortion took place in one case on the first day of attack; mother 4 months pregnant. In two others abortion came on during the 2nd day, and in the remaining case on the 3rd day of the attack, the mothers being 6 months pregnant. In one 6 months case the mother's temperature and general condition were favourable for recovery, but, in spite of opium in large doses, miscarriage came on and precipitated a fatal issue. The mothers died at the following dates: One on the 5th day, one on the 3rd day, one on the 4th day, and one on the 22nd day of the disease; the latter from septicæmia. Unless this experience be exceptional, pregnancy must be looked upon as a very alarming and generally fatal complication of plague.

Diseases of the skin and cellular tissue.—Bed-sores only developed in one case at the end of 30 days, and this patient was particularly helpless and unable to move in bed, or help herself in any way owing to paralysis. The seat of the bed-sores was over the sacrum. No case developed gangrene as a sequela. Lymphangitis occurred in 7 cases, led to abscess which had to be opened, and protracted convalescence. In one case a month elapsed before the lymphangitis developed itself; most of the others came on between the 10th and 20th day of convalescence. It was a remarkable phenomenon that the temperature was seldom elevated. In two patients only did it touch 99·8°F., and pain in the affected part was often the only symptom complained of. The lower extremities in the calf of one leg was the seat in 5 instances, once in the neck, and once in the parotid region. In no instance did the pus of the abscesses yield plague bacilli, although every such case was carefully examined for this object.

Boils are a frequent sequela; 15 patients having one or more boils at some period of their convalescence. Boils usually appeared about the 10th day. The most frequent seat was the scalp; next the legs; and next the upper extremities. One patient had 15 boils at one time, 13 on the scalp, 1 on the face over the parotid gland, and 1 on the side of the neck, and they all appeared between the 15th and 20th day. This patient died; the other 14 recovered.

The boils could not be attributed to any want of fresh vegetables in the dietary, as 4 oz. of vegetables were given 2 days in the week and 1 oz. of lime-juice twice weekly to each of the patients.

One patient had 21 consecutive boils and ultimately recovered, although convalescence was complicated by double broncho-pneumonia as well.

Syphilis was present in 4 patients admitted, of whom 1 died and 3 recovered.

Buboes in Plague.—A tabular statement of the sites of buboes has been already given. They are usually accompanied by some pain. Indeed, very often the onset of pain is the first thing to direct the patient's attention to the inflamed gland. Tenderness is an almost invariable sign, and oedema surrounding the bubo. A large amount of surrounding oedema is an unfavourable symptom. The skin over the bubo is generally freely moveable, seldom inflamed, and still less frequently overpainful. The bubo is generally found to be tender, rather than painful, and even exquisitely tender patients seldom cried out with pain but winced when the bubo was touched. Buboes never preceded the onset of general symptoms in any of the cases met with. They usually came on rapidly in the majority of cases (70 per cent. of those with buboes) on the 2nd day; next most frequently on the 3rd day (15 per cent.); next on the 4th day, 12 per cent.; and on the 5th day 2 per cent.; and in 2 cases did not appear till the 6th day from the onset of the initial symptoms. Both these

last cases were of a malarial remittent type, and were kept in a separate ward. Bacteriological evidence confirmed the diagnosis, and both ended fatally.

A reference to the table will show the fallacy of depending on the appearance of so-called characteristic buboes in this disease and the use of the term "Bubonic Fever" to be a misnomer. All cases without buboes—other than primary pneumonias—were shown by examination *post mortem*, or by bacteriological test to be Plague, wherever an opportunity to do so could be got. The majority of buboes left to take a natural course subsided without suppurating. In only 7 per cent. of acute bubonic cases, in which no irritant application had been used, and to which sedative liniments or ointments had been applied, did suppuration ensue, whilst, as was generally the case when such irritants had been used, suppuration was the rule. Patients liked to busy themselves with treatment of the local expression of the disease, and poultices, marking nut, iodine, or nitrate of silver were very constantly used.

Many observers think that the *vis medicatrix naturæ* in plague is by suppuration of the inflamed gland; but nature's trend in this disease is to place the patient on the burning ghat. It is overlooked that at least 60 per cent. of plague patients died before there has been time for suppuration, and how many died before reaching hospital, struck down suddenly, no one can estimate. No doubt, if the patient survives long enough, suppuration may occur, especially when poultices or irritants have been used. It would appear that such conclusions as that suppuration is beneficial, result from a study of virtually selected cases; and the safer and juster conclusion is that, because the patient has survived long enough, his bubo has suppurated, and not that because of the suppuration he has recovered.

In some instances patients with buboes were sent into hospital who were proved by bacteriological methods not to have Plague. Two instances of sympathetic buboes due to ulcer of the leg were of such a nature, and one case of syphilis; none of which on puncture and cultivation of the contents of the inflamed glands gave any characteristic growth.

As regards treatment of buboes, an emollient sedative application, such as glycerine and belladonna, is generally useful. Poulticing and incisions were not practised, but in patients received from other hospitals ample opportunity was afforded for studying the results of such modes of treatment as seemed to delay convalescence considerably and lead to anæmia and debility. Excision of the bubo was entertained, but not considered prudent. To promote absorption equal parts of creosote and glycerine seemed the best application.

This was rubbed in on alternate days, in one drachm at a time in some cases, and generally with good effect. Iodine was of no use in procuring absorption. An ointment of oleate of mercury (10 per cent.) gave satisfactory results in hastening the absorption of the buboes.

Opening the buboes, except when this is absolutely necessary, is to be deprecated, as wounds in plague patients heal very tardily, and if opened at all, this should be done freely and the wound immediately deluged with antiseptics, and treated antiseptically to avoid the absorption of noxious products.

Treatment.—Prophylactic and Rational.

The removal of the defective sanitary condition which gives rise to the disease, the segregation of the sick in hospitals, and of their friends in observation camps until the period of incubation is over, and the disinfection of habitations, fomites of all kinds, and personal hygiene.

The value of segregation can be appreciated by a consideration of the facts of the contagiousness of plague in habitations and its almost non-contagiousness in hospitals.

In the treatment of plague, symptoms can be relieved and the chances of a favourable termination promoted ; but little can be done to shorten its course or ensure recovery.

If the patient can be kept alive till the eighth day without complications supervening, the disease will have exhausted itself and the patient recover.

The success of any treatment depends on early and good nursing, and keeping the patient lying down until the temperature has been normal for at least four days. *The injudicious breach of this rule, viz., that the patient should not even sit up for any purpose, led to the death of twenty convalescents by syncope in spite of urgent and repeated warnings.*

Abundance of fresh air is of next importance, and in Parel each patient had nearly 2,000 cubic feet of air space and free perfusion of air.

On admission, the patient was undressed, well washed (including the head) with hot water and carbolic soap, and a change of clothing provided. Those who seemed too weak for general bathing were carefully sponged all over. Personal clothing too filthy or worthless was burned at once. Valuable clothing was disinfected by steeping in 1 in 2,000 perchloride of mercury solution before being sent to be washed.

Every patient on admission got rum mixture as a stimulant and some sago congee, if required in the opinion of the medical attendant. The patient was put into a fresh bed in the appropriate acute ward, and the presence of at least one attendant constantly enforced. As a routine to adults, five grains of calomel and thirty grains of compound jalap powder were administered.

The patients were fed four times in the day, and acute cases had always a supply of sago congee, Brand's Essence of Mutton, or Virol, or Liebig's Extract of Meat, and rum up to eight ounces in the day, and especially at night.

Symptoms were treated by appropriate remedies as they arose. The fever was best combated by sponging and the ice-cap. Antipyretics, such as antifebrin and phenacetin, were not found suitable and had only a transient effect in reducing high temperature.

Stimulants were well borne, and it seemed almost impossible to intoxicate plague patients with large doses of alcohol—up to eight ounces in the day in several instances. Even in boys and patients unaccustomed to alcohol, this *quantum* failed to induce drunkenness.

Medicinal stimulants and tonics, especially nervine stimulants, were most useful. In acute cases a routine dose was—

Rx. Acidi Nitro-hydrochlorici dil...	m. 20.	} Three times daily.
Quininae sulphatis	gr. 5.	
Liquor strychninae	m. 5.	
Spirit chloroformi	m 20.	
Aquæ camphoræ ad	ʒ 1	

Among other useful drugs employed were ammonia carbonate, citrate of caffeine, tincture of strophanthus, tincture of digitalis and nitrate of pilocarpine (for uræmic symptoms).

For the Relief of Distressing Symptoms.—Headache was treated by the ice-cap, blisters occasionally (but not found remedial), evaporating lotions, and especially camphorodyne, bromide of ammonium, and opiates.

Sleeplessness was combated by liq. opii (sedative) or liq. morphine, bromides and camphorodyne.

Vomiting was usually checked by bismuth, mucilage, and hydrocyanic acid, in effervescing draughts. Pulmonary congestion by diffusible stimulants, turpentine stupes, blisters, and alcoholic stimulants; with digitalis.

As a special mode of treatment, liq. hydrargyri perchloride was resorted to from a conviction of the value of such a powerful disinfectant in specific disease, and the likelihood of its being useful as an intestinal disinfectant and bactericide.

At first it was given in drachm doses, well diluted, three times daily; later in half ounce doses every two hours for four doses; and then in the same quantities every eight hours. In no case of plague did these enormous doses induce salivation, although this phenomenon was carefully sought for.

One doubtful case became salivated slightly after the third dose, and the bubo in this case was proved to be sympathetic from an ulcer on the foot. The bubo in the groin of the corresponding leg was punctured antiseptically and the contents examined microscopically and by bacteriological cultures, and found not to contain the specific micro-organism of plague. This mode of treatment is therefore both diagnostic and rational.

The drug was also given by hypodermic injection below the situation of the inflamed gland in five cases, and four of these recovered, and one died. The general result of the hospital treatment may be attributed to this mode of medication (with remedies for prominent symptoms and complications), and gave 69.2 per cent. of recoveries, excluding cases moribund on admission, and those treated by MM. Yersin and Haffkine.

The Hospital staff and skilled and intelligent nurses had great confidence in the perchloride of mercury treatment; but it is only right to state that many cases treated early and vigorously with this drug died; after perhaps temporary benefit and prolonged life.

In one remarkable case which died six days after admission from double broncho-pneumonia, and under full doses of mercury, the German Scientific Plague Mission Experts found plague bacilli on three different days in the blood cultures, and the day before death, and at the *post-mortem* not a single plague bacillus could be demonstrated in the blood or any of the organs. Their conviction was that the patient died from the severe complication, and had his vitality been greater and no complication supervened, he would certainly not have died of plague; all the bacilli being destroyed.

No after untoward symptoms developed in convalescents after mercurial treatment in such heroic doses.

The discovery of a curative remedy for plague remains yet to be demonstrated.

Generalities.—The excreta were received into bed-pans already sprinkled with 15 per cent. carbolic powder, and before removal from the ward a solution of 1 in 2,000 perchloride of mercury was poured over the mass. This solution was colored blue by aniline and kept in a separate place to distinguish it and prevent accidental poisoning. The fluid and solid portions were separated and stored in suitable receptacles mixed with phenyle 1 in 30, and the fluid portion removed in the conservancy cart. The solid excreta, already disinfected again by phenyle, were mixed with dry sawdust, thrown on stable litter, dried in the sun, deposited on layers of charcoal, and destroyed in the incinerator.

All bandages and dressings were destroyed by fire after being spoiled once.

Dead bodies were wrapped in a sheet soaked in perchloride of mercury and immediately removed to the mortuary.

The bedding was disinfected before being washed and again taken into use, the straw stuffing of pillows and mattresses burnt, and the cots re-whitewashed.

Discharges from patients, soiling the floor, were at once disinfected with carbolic powder, and swept up and removed; and the place further disinfected with perchloride solution and whitewashed or scrubbed.

Patients in hospital were allowed to sit up when the temperature had been normal four days, and then moved into the convalescent wards. They were not discharged as a rule till ten days afterwards at the earliest. The majority of patients were discharged 23 days after admission. The shortest stay in hospital was 9 days, the longest 100, before convalescence was established. One convalescent deserted on the 23rd day.

Before discharge each patient received a warm bath with carbolic soap, a perfectly new suit of clothing, a small gratuity, and a certificate of recovery from infectious diseases, stating the number of days in hospital.

As measures of personal hygienic precautions, the hands of attendants were dipped in mercurial solution, a special complete suit of hospital clothing put on before going on duty, and on coming off duty disinfected and dried in the sun; and a bath twice daily, containing a little phenyle, enjoined.

The Röntgen Rays were tried on five patients, and two of them died and three recovered. They were used for periods of half an hour over the bubo. Patients seemed slightly benefited. The apparatus was presented by the Maharaj Tagore, but unfortunately opportunities to test its efficacy did not occur, and when the installation was ready further plague cases ceased to be received into hospital.

BACTERIOLOGY OF PLAGUE.

The following points were personally verified in the bacteriological investigation of plague at Parel, or communicated by the German Experts :—

Professor Dieudonné states : “ In cover-glass preparations, *in fatal cases*, the specific micro-organism was discovered. In only one case that recovered was the bacillus demonstrated, and this was in a child 4 years old with right parotid bubo, in whose blood bacilli were found four times out of five examinations. In no case was the bacillus found in the faeces or urine. In every case it was discoverable in the contents of the inflamed lymphatic gland and in pneumonic cases in the expectoration. It was not found in the pus from buboes, or abscesses following lymphangitis; and repeated examinations failed to discover it in the blood or buboes of convalescents when the temperature reached normal.”

VERIFIED PERSONALLY.

The micro-organism is 1 mm. by 2 or 3 mms. Both ends stain deeply with aniline dyes. It is a short, thick rod with rounded ends as seen by $\frac{1}{2}$ oil immersion lens. It is non-motile in hanging drop preparations. It is decolorised by Gram's method.

It grows on agar-agar and gelatine. It takes 24 to 48 hours for characteristic whitish grey, (pin-head size,) colours to form, and they have iridescent borders.

Spores are not formed, and it does not liquefy the media. Viewed by transmitted light, the growth has a stippled, granular appearance like the back of the looking glass. The growth on agar is alkaline.

Involuted forms, in the shape of small cocci, large cocci, pyriform bodies, dumbbell-like forms, but without a handle, and swollen bodies were produced on salt solution 4 per cent. in agar, also by $\frac{1}{100,000}$ of perchloride of mercury in agar; and by dipping into 25 per cent. sterile salt solution momentarily and touching the agar surface at one spot (blob culture on pure agar) in 24 hours.

When involution-form cultures were re-inoculated on to pure agar, they reverted to the ordinary type met with.

The virulence of involuted forms was not investigated owing to want of opportunity. The optimum temperature is 37° C.

Heat up to 120° F. killed the cultures on agar, and an old agar tube re-sterilised failed to produce a growth on three occasions when re-inoculated.

Exposure to strong sunlight for a few minutes killed the bacilli, but mere staining them without heating did not seem to do so.

Alkaline bouillon containing fat produced flake-like islands underneath the surface, which fall to the bottom like vermicelli choppings on shaking the containing flask. This growth appeared in 24 to 48 hours, and continued to grow and develop fresh festooned flakes for upwards of a month.

The growth on agar is sticky and viscid, and non-adherent to the medium.

Bacilli were *not* found in the lochial discharges of aborted females, nor in the catamenial discharge, nor in the bodies of the products of conception in three out of four foetus examined.

Numerous bacilli were found in the inflamed gland by rubbing a cover slip on a freshly-cut (sterile) surface, drying the slip, and staining in the ordinary basic aniline dyes.

A beautiful double stain for tissues with specific plague bacilli consists of alcoholic solution of eosin followed by methyl blue, the tissue being fixed by alcohol without heat, and the slide gently washed in water, between the two additions of dyes.

POST-MORTEM APPEARANCES.

In all 36 autopsies were performed at Parel, the smallness of the number being explained by the difficulty of obtaining leave to make *post-mortems* on natives of India, owing to the objections of their relatives. No case was examined without full consent of the deceased's friends, and most of the bodies were unclaimed.

Summarising, the appearances noted were—

Rigor mortis of short duration and not well marked.

Emaciation, not pronounced, owing to rapidity of death. No particular tendency to rapid putrefaction.

Discolorations of the skin and cuticular eruptions or abrasions absent. Boils and wounds, the result of sequelæ or opened abscesses, and inflamed glands occasionally found. Blood darker and more fluid than natural. Cerebral membranes congested and the sinuses full of dark, thin, blood. Pia mater and brain substance œdematous, with numerous punctiform hæmorrhages. Petœchiæ on the membranes often noted, especially on the pia and dura mater of the vault. Ventricular serum above normal amount. Actual cerebral apoplexy never seen.

Pharynx and œsophagus generally normal; at most slight redness and congestion of the mucous membrane of the former. Stomach hyperæmic, and vessels much congested, especially at the greater cardiac end; numerous hæmorrhagic petœchiæ in the mucous coat along the lines of congested blood-vessels. Erosions of the surface at the pyloric end in some cases, and mammilation and soft œdema of the mucous membrane in others.

The duodenum had generally a normal appearance, a few punctiform hæmorrhages and small petœchiæ excepted.

The ileum and large intestine presented numerous petœchiæ and patches of congestion, and the solitary and agminated glands usually swollen, especially in the lower part of the ileum. No ulceration of Peyer's patches found.

The mesenteric and retro-peritoneal glands were more or less affected in nearly all cases, being enlarged, dark grayish or red in color, but seldom showing hæmorrhagic infiltration or suppurating foci.

The spleen was enlarged, dark brown, blue, grey, or red on surface, acutely congested and with petœchiæ on the capsule, and hæmorrhages in the stroma.

Liver enlarged with pale yellow necrotic patches superficially, with small hæmorrhages under the capsule. Petœchiæ were commonly found on the upper surface on each side of the suspensory ligament. On section its substance was bloody, soft, and friable.

The gall bladder contained bile and showed many minute petœchiæ on its serous and mucous coats and in the bile-ducts.

The pericardium often showed petœchiæ, and occasionally some were found on the endocardium. The heart substance was invariably healthy and no valvular lesions discoverable.

The larynx was of a dark purplish red hue on the surface, and the mucous membrane cedematous and congested with sero-mucoid exudation and oedema glottidis in some instances. •

The lungs were usually congested and cedematous, especially the lower lobes; and frothy, bloody exudation oozed out on section. Pneumonic cases had inflamed patches at the margins and on the front of the lobe affected. The patches were airless, friable, and surrounded by rings of engorged and congested lung. Pleurisy was seldom found. Petechiæ and ecchymoses were frequent on the visceral pleura, and rare on the parietal.

Pleural effusion and adherent pleuræ met with in one case.

The most constant pathological appearance was the presence of hæmorrhages in great numbers in the capsule and pelvis of the kidneys; and engorgement of the renal organs with blood; and infiltration of the peri-renal tissues and absence of the normal fatty surroundings.

The capsule was loose; cortex increased, and dark red; and pyramids prominent and congested.

The buboes consisted of inflamed lymphatic glands with hæmorrhagic foci, and surrounding connective tissue cedematous and infiltrated with blood and serum. The morbid alterations were more noted in external than internal buboes, even when the latter were the only ones present.

The blood-vessels and lymphatics in the neighbourhood of the buboes were infiltrated and sometimes adhered to the inflamed superjacent mass of altered gland tissue.

Very often a matted mass of inflamed glands were found leading up along the blood-vessels from the primary external bubo; and in one instance this condition was found extending from the femoral glands along the iliac vessels and aorta to the diaphragm. The mesenteric glands in vascular relation with the affected intestines, were invariably enlarged.

In puerperal cases the aborted hæmorrhagic infiltration between the layers of the broad ligament, inflammatory oedema of the round ligaments and ovaries, and petechiæ, and softening of the mucous and serous membranes of the sub-involuted uterus, were noticeable.

In one such case a piece of adherent placenta was found at the uterine ostium of the right Fallopian tube. Hæmorrhages in the sheaths of the blood-vessels were frequent, and infective infiltration extending from the femoral bubo in nearest relation along the veins.

Medical Report of Parel Plague Hospital, dated 4th July, by Surg.-Capt. G. S. Thomson, I.M.S.—(continued).

M. HAFKINE'S CASES.

The first acute plague case admitted was treated by M. Haffkine with his curative serum. A clerk, aged 23 years, ill since 10 p.m. on the 24th of February, was admitted on 25th at 7 a.m. and injected at 11 a.m. with 10 ccms. of serum; again injected at 11 a.m. on 26th February by 10 ccms. of serum. He died at 2 p.m. on 27th February. This was an ordinary, mild case of plague. After the injections his temperature rose to 106.4°F., and the pain in the right femoral bubo became very great; this patient, indeed, complained more of violent pain than any ever seen in hospital. His delirium increased with jaotitation, rapid respiration, vomiting, unconsciousness, stupor, and coma ending in death.

Two cases (one given in detail) were admitted with plague following prophylactic injection by Haffkine's serum. The other case was a male, aged 20 years, Ganu Govind, admitted 2nd April with plague and a huge left inguinal bubo. He had applied marking-nut and the bubo subsequently increased and sloughed out *en masse*.

He had been injected once in the left arm about a month before being attacked, and a small hard nodule was detectable at the point of inoculation. The case was a mild one of the common type, and ended in recovery on the 58th day after admission; convalescence being delayed by the deep ulcer in the groin. The acute symptoms subsided on the 5th day, and he had no sequelæ or complications except the ulcer. Another case was seen amongst transfers from other hospitals; affected 10 or 11 days after the first and only inoculation, and he recovered.

The cases seen at Parel were mild and recovered; but the number met with is too limited to draw any definite conclusions from them.

History of a Case Prophylactically Injected by M. Haffkine's Serum.

Registered No. 417, Ardesir Jijibhai, male, aged 10, school-boy, admitted 30th April at 5 p.m. from Mombadevi, Dhanji Shera Street, No. 93 house, and discharged on 7th May.

Came from Pydowni district, Bombay, where he resides with his father, who looks after his education himself; the boy not having been sent to school, owing to the epidemic of plague, for some months past. No plague cases had occurred in the house he lived in; some had occurred in the neighbourhood, but not for a long time; and he had not been in contact with plague patients or any known source of infection. No dead rats had been found in the house or its surroundings. He had been inoculated on 24th April with 1 ccm. of Haffkine's serum in the left arm, which was followed by slight fever, and he did not sleep that night owing to pain in the arm; but there was no vomiting, thirst, diarrhoea, or any other symptom, and next day he was quite well.

At 5 p.m. on 29th April (that is, six days after inoculation) he became ill with fever, headache, and prostration. There was no vomiting, delirium, and the bowels were moved twice; he slept well the previous night. At 7 p.m. a small bubo appeared in the left groin—painful and tender. He was not thirsty, but took to his bed owing to pain in the groin and giddiness, and a medical man was sent for who saw him at 8 p.m. and gave him medicine. At this time the temperature was 102°F. according to the father's statement.

This morning, after a restless night without delirium, he took some light refreshment consisting of tea, milk, and eggs with a little bread, and his temperature was 103° F. At 2 p.m. M. Haffkine saw the boy and found his temperature 102° F., and advised his father to take him to hospital. At this time he had no appetite, was prostrate, and stayed in bed till he was conveyed to Parel Hospital, where he complained of headache, pain in the left groin and thirst. The swelling in the left groin was very hot and tender.

Present State.—A slim, fairly well-nourished Parsee boy, quite conscious and intelligent. No characteristic facies present. Eyes not injected, pupils normal. Skin warm and perspiring, with prickly heat, eruption, and sudamina.

Tongue thickly coated with white fur, tip and edges clean, fungiform papillæ prominent, especially near the tip. Gums spongy and slightly swollen. Peculiar fætid odour from the breath. Veins of neck pulsating. Cardiac sounds strong, loud, and healthy; chest normal, lungs healthy. Liver and spleen not felt. A bubo, the size of a bean, just below the level of Poupart's ligament, near its middle on the left side, very tender, and, being well defined, plainly visible. The skin over the inflamed gland is hot and tender. The bubo can be moved a little and the skin is not adherent to it, nor is there any œdema surrounding it. There is a small, tender, shot-like gland in the left axilla close to the pectoral wall.

Remains of a speckled rash, like mosquito bites and prickly heat scratchings, can be seen on both sides of the ankles and legs of both lower extremities; but there are no apparent wounds. Temperature 102; Pulse 132, soft and compressible, but regular; Respiration 36. Chiefly complains of headache, thirst, anorexia, and pain in the groin.

May 1.—Temperature 100°; Pulse 20; Respiration 36. Slept well during the night. Bowels moved four times—thin, greenish-yellow in color, and bad smelling, following a purge consisting of calomel 5 grs. and pulv. jalap. œ. 30 grs. at 6 p.m.; bubo very tender. No delirium or incoherence in speech. Headache less, and he says he feels better. Given large doses of perchloride of mercury and stimulants since admission; 2 drs. of liq. hydrargyri every two hours and stimulant mixture (equal parts rum and water) one ounce every three hours. Blood examined for plague bacilli, but none discovered. Urine slightly cloudy with albumen, by heat test; bile pigments present.

At 5 p.m. Temperature 101° F., Pulse 124; Respiration 30. He vomited three times since morning, but was otherwise well.

May 2, 8 a.m.—Temperature 99·6° F.; Pulse 100; Respiration 36. Pulse full, soft, forcible, and large. Tongue clean, except towards the posterior part on each side of the central line. No headache, slept from 2 till 6 with the aid of a draught containing morphine and bromide; skin warm and clanny. Appears drowsy. Bubo in left axilla not detected. Bubo in left groin longer, more standing out in relief from its surroundings, no œdema over or around it. Sudamina present, rash-like eruption faded.

May 3, 8 a.m.—Temperature 99° F.; Pulse 96; Respiration 20. Patient slept well. Tongue has two patches of yellow dry fur at the back. Bowels confined, urine passed naturally, normal in appearance, and to clinical test. Feels thirsty and tired. Quiet, conscious, and intelligent. At the evening visit his temperature was normal, bubo less in size and no longer painful. Skin dry. Tongue dry and clean. No headache. Pulse and respiration normal. Convalescent.

May 4.—The bubo was absorbed and the patient practically well, having made a rapid recovery from a mild attack of plague. He was allowed to go home on 7th May 1897.

APPENDIX II.

Nominal Roll of M. Yersin's Cases, Temperature Charts, Details of one Case, Summary and Analysis of Cases.

Patients injected with M. Yersin's Serum in Parel Plague Hospital.

Serial No.	Reg. No.	Caste.	Occupation.	Name.	Sex.	Age.	Day of Disease.	Date, hour, and amount injected.		Total amount of serum.	Result and Remarks.
1	102	N. Christian	Medical Practitioner...	O. D. Nunes	...	...	4-5	6-3-97 at 6½ p.m. 30 ccm.	7-3-97 at 8½ a.m. 20 "	50 ccm.	Died at 7 p.m. on 8-3-97.
2	104	"	.....	B. Nunes	...	...	2	6-3-97 at 8½ a.m. 20 "	7-3-97 at 8½ a.m. 10 ccm.	30 "	Recovered on 21-4-97.
3	105	"	.....	R. T. Nunes	...	...	8	7-3-97 at 6½ p.m. 10 "	8-3-97 at 4½ p.m. 20 "	40 "	Died at 3 p.m. on 23-3-97. Meningitis.
4	100	.....	.....	D. Panda	...	...	2	7-3-97 at 8½ a.m. 50 "	8-3-97 at 8½ a.m. 20 "	50 "	Recovered on 21-3-97.
5	109	.....	.....	S. Bappa	...	...	8-4	7-3-97 at 9 a.m. 20 "	8-3-97 at 8 a.m. 10 "	60 "	Died at 11 p.m. on 11-3-97.
6	110	.....	.....	S. B. Kadam	...	...	3-5	7-3-97 at 8½ a.m. 20 "	" 4 p.m. 20 "	80 "	Died at 1 a.m. on 8-3-97.
7	112	.....	.....	P. Debaro	...	...	2	7-3-97 at 6 p.m. 10 "	12-3-97 at 3 a.m. 40 "	100 "	Died at 10 p.m. on 12-3-97.
8	113	.....	.....	R. Munda	...	...	2	11-3-97 at 8 a.m. 50 "	10-3-97 at 4 p.m. 40 "	30 "	Died at 9-45 p.m. on 8-3-97.
9	114	N. Christian	School-boy	J. D. DeSouza	...	...	36 hours.	8-3-97 at 5 p.m. 50 "	9-3-97 at 4 p.m. 40 "	80 "	Died at 4 p.m. on 20-3-97.
10	115	"	.....	P. Rama	...	...	2	8-3-97 at 4 p.m. 40 "	9-3-97 at 8 a.m. 30 "	60 "	Recovered on 25-3-97.
11	117	N. Christian	Domestic	R. Fernandez	...	...	(*)	8-3-97 at 5½ p.m. 20 "	" 20 "	20 "	* Injected prophylactically.
12	120	.....	.....	M. Daya	...	...	2	8-3-97 at 4 p.m. 40 "	12-3-97 at 8 a.m. 40 "	40 "	Died at 4 a.m. on 11-3-97.
13	124	.....	School-boy	R. Narunda	...	...	1	9-3-97 at 5 p.m. 40 "	13-3-97 at 8 a.m. 30 "	190 "	Recovered on 14-4-97.
14	132	.....	Sweeper	S. Jiwa	...	...	2	10-3-97 at 8 a.m. 40 "	18-3-97 at 8 a.m. 30 "	110 "	Recovered on 31-3-97.
15	133	.....	"	B. Jetha	...	...	2	11-3-97 at 8 a.m. 40 "	18-3-97 at 8 a.m. 40 "	110 "	Recovered on 4-4-97.
16	138	.....	Clerk	R. G. Shanker	...	...	36 hours	12-3-97 at 5 p.m. 40 "	12-3-97 at 4 p.m. 50 "	90 "	Died at 13 p.m. on 13-3-97.
17	139	.....	.....	T. Mhadu	...	...	2	11-3-97 at 4 p.m. 50 "	13-3-97 at 8 a.m. 50 "	230 "	Recovered on 23-3-97.
18	150	.....	.....	M. Soma	...	...	26 hours.	12-3-97 at 4 p.m. 50 "	16-3-97 at 4 p.m. 50 "	40 "	Died at 11 p.m. on 12-3-97.
19	151	.....	Gardener	K. Harka	...	...	4-5	12-3-97 at 4 p.m. 40 "	12-3-97 at 4 p.m. 40 "	40 "	Recovered on 12-4-97.
20	155	.....	Musl	L. Rodrigues	...	...	8-9 hours.	15-3-97 at 11 a.m. 40 "	16-3-97 at 1 a.m. 40 "	40 "	Died at 8 p.m. on 15-3-97.
21	170	.....	Merchant	A. K. Telle	...	...	9 hours.	16-3-97 at 1 a.m. 40 "	18-3-97 at 5 p.m. 50 "	140 "	Recovered on 31-4-97.
22	173	.....	Cook	M. Edaji	...	...	3	16-3-97 at 9 a.m. 50 "	" 50 "	60 "	Recovered on 9-4-97.
23	201	.....	.....	D. Edaji	...	...	27 hours.	16-3-97 at 4 p.m. 50 "	" 50 "	50 "	Died at 9 a.m. on 1-4-97.
24	...	.....	.....	Hanabhai	...	...	7 "	16-3-97 at 4 p.m. 50 "	" 50 "	50 "	Recovered in Clare Road Hpl.
25	331	.....	.....	C. Muralo	...	...	24 "	4-4-97 at 11 a.m. 50 "	8-4-97 at 9 a.m. 50 "	100 "	Died at 5 p.m. on 9-4-97.
26	413	.....	.....	K. B. Satwaji	...	...	13 "	7-4-97 at 6 p.m. 40 "	" 40 "	40 "	Died at 8 a.m. on 2-5-97.

Detailed History of Last Case injected with M. Yersin's Paris Serum.

Reg. No. 413, Kasi-bin-satwaji, Hindu, female, age four years, admitted on 27th April 1897, at 2 p.m., to Parel Hospital from a chawl at Sowri.

History.—April 25.—At 12 midnight she had a rigor with headache and hot skin, but no vomiting, diarrhoea, or delirium, and for the remainder of the night was restless, thirsty, and feverish. She had been playing about and was in her usual health up till the hour of attack noted.

April 26.—During the day she was up and playing with other children; but seemed stupid, quiet, and slightly hot to the touch; and the same night she was restless, sleepless, tossing her head and arms about, and had stupor at times. The urine was scanty and febrile, and the bowels moved naturally once.

At 5 p.m. she complained of pain below the left ear, and a swelling was noticed in this situation between 8 and 9 a.m. on the morning of the 27th April. She continued to be feverish and stupid, and at times wandering in her talk, and was brought to hospital.

Present State.—A well-nourished young female child, drowsy, eyes half closed, pupils contracted, can be roused to answer questions when spoken to loudly; is irritable, and appears to want to be left alone. Tosses her head from side to side. The eyes are not injected. Tongue covered with a thick white fur increased towards the posterior part of its dorsum; edges and tip clean and red. Respirations easy, 40 per minute. Skin hot, head and neck perspiring; rest of surface hot and dry. Is very irritable when touched. Heart and lungs normal, abdomen soft and flaccid, liver palpable in right hypochondrium, extending two inches below the rib. Margin in the nipple line, and half way between the xiphoid cartilage and the umbilicus. The bubo consists of a soft swelling, hard in its deeper parts below and behind the angle of the left jaw, about one inch in diameter in size. Skin over bubo soft and giving a sodden feel, equal to soft oedema. Two small shot-like glands in the right groin; no glands palpable elsewhere, and those in the right groin are not tender, inflamed, or painful. No eruptions or wounds noticeable. Patient complains of headache, and pain in the inflamed cervical gland. Temperature 104, pulse 132, soft and compressible, and markedly small and dicrotic in character, beats very regularly, but feebly.

At 6 p.m. 40 cems. of the Pasteur Institute antipest serum, prepared by M. Roux and supplied by M. Yersin, were injected in the flanks as practised by M. Yersin for plague cases. Temperature 104.4°F.; pulse 130; respiration 44. In three hours after, there was no change in the general condition of the patient, and the local conditions were, if anything, more acute. Temperature 104.8°F.; pulse 136; respiration 40.

April 28 at 8 a.m.—Temperature 99.4°F.; pulse 120; respiration 6; skin cool. Tongue with less fur, headache less. Slept a little during the night without delirium; bowels constipated. Bubo painful and very tender, and surrounding oedema increased, extending over the angle of the jaw and sternomastoid. Urine of a febrile character containing a little ($\frac{1}{2}$) albumen passed three times. Thirst less, but is very weak, prostrate and irritable.

At 5 p.m.—Temperature 103.4°F.; pulse 144; respiration 36. Pulse small, compressible, and very feeble. Patient very drowsy, irritable, tossing restlessly about in bed, trying to get up at times. Bowels moved thrice and motions bad smelling, green, and watery especially the two last passed. Tongue cleaner. Bubo shows much more oedema, and is distinctly larger and very painful and tender. Skin hot and dry. Thirst very great. Headache has returned. Refuses food, medicine, and stimulants. Breath foetid. Urine scanty, high colored, and depositing urates. Eyes sunken and voice low and weak, and she appears to be greatly prostrated.

April, 29th at 9 a.m.—Temperature 101° F.; pulse 142; respiration 24.

Bubo much larger, measuring $3'' \times 3''$, with much surrounding oedema, and very tender; and the front part of the neck below the left side of the lower jaw is swollen, and infiltrated by soft oedematous inflammation. Tongue covered with brownish fur, very dry, and rough. Pulse small, weak, and running. Slept two hours after 20 ms. liq. morphinæ and grs. 30 ammon. brom. Bowels moved once, urine passed, very thirsty. Swelling, tenderness, and hardness over upper part of right sterno-mastoid where a fresh bubo has developed. Patient is conscious, but stupid and drowsy. Headache less, cannot swallow food or stimulant, asks for water and again rejects it. All attempts at swallowing, cause regurgitation through the nostrils. Skin hot and dry, abdomen distended. Nothing abnormal in chest or abdomen is detectable. Feeding by nutrient enemata resorted to.

In the evening eyes sunken, tongue increasedlly furred, voice weak, very irritable, skin very hot, thirst excessive, looks sinking, and gasps for breath at times. At 6 p.m. temperature 105.2° F.; pulse 144, weak and anacrotic; respiration 60. sighing and irregular. Buboes very tender. Eyes half open. Patient semi-comatose. Bowels moved once; yellowish, thin, and very foetid. Urine passed naturally in bed-pan. Fed regularly by enema.

April 30.—Temperature 102° F.; pulse 144; respiration 36. Buboes have appeared in each groin, and that beneath the right sterno-mastoid is larger and oedema extends from it to the angle of the jaw. Swelling of neck—collar-like, soft, and boggy. Tongue furred, slightly moist. Respirations laboured, short and stertorous. Bubo at left side of neck larger, and skin over it hot and oedematous, with brown hardness in deep parts. Eyes sunken. Bowels and bladder evacuated last night, but not since 10 p.m. Thirst present; very irritable and prostrate. Fed by enema as before.

At 6 p.m.—Temperature 104.8° F.; pulse 144; respiration 60. Skin very hot, cries out, is restless, irritable, slept a little during the day. Bubo on left side of neck much larger and more indurated; two buboes can be felt beneath the margin of the right sterno-mastoid. The buboes in right groin are pea-like, in left groin shot-like, having diminished since morning a little. Refuses stimulants and water by the mouth, as swallowing is impossible, the liquid visibly regurgitating. Enemata continued and stomach tube resorted to by the nurse.

May 1.—Temperature 103.4° F.; pulse 120; respiration 24. Patient is very drowsy, unconscious, comatose, swelling of neck enormous, respirations stertorous, patient evidently sinking. Died of syncope at 8 a.m. on 2nd May 1897, having remained in the same state of coma for 24 hours.

Analysis of M. Yersin's Cases.

In all, 27 persons were injected at Parel Hospital with M. Yersin's serum. One is excluded from the tabular statement as it certainly was not a plague case. Injected at his own urgent request; he died of remittent fever two days afterwards. One patient sent specially to be injected from Clive Road Hospital may be excluded, but was reported as recovered and is shewn in the table. One person was injected prophylactically, and did not develop plague during 41 days under observation in a separate ward. It is to be noted, that this woman's child remained in the ward with her and did not develop plague, although not prophylactically injected.

Case No. 3 in the series had cerebro-spinal meningitis, and an osseous tumor was found compressing the medulla and spinal cord against the basilar slope of the occipital bone and margins of the foramen magnum, to which death was due.

Of the remaining 23 cases of undoubted plague, 13 died and 10 recovered mortality per cent., 56·5.

Known day of disease.							Died.	Recovered.	Percentage of mortality.
1st day	...	...	...	...	...	...	2	2	50·0
2nd "	...	...	...	...	...	...	8	6	57·2
3rd & 4th day	...	...	...	...	...	...	4	1	80·0
4th & 5th "	...	...	...	...	...	...	1	1	60·0
Definitely known in hours 3—42	...	...	...	...	...	...	7	1	87·5

The temperature charts, with the actual times of taking observations, show in red when the patients were injected, the amount of serum, and the exact temperature at the time of injection. The temperature, pulse, and respirations were recorded and taken personally immediately before injection in each case.

The most obvious effect was a marked fall in the temperature. In a few cases the fever increased, and in a few no effect was produced.

Patients seemed less liable to complications, but No. 9 in the series developed double broncho-pneumonia on the fourth day in hospital; and, after, 80 ccm. of serum had been injected. The pneumonia came on two days after the last injection, and he died eight days later.

Delirium seemed to be lessened by the serum. No improvement in the general condition of the patients could be seen, and the inflamed glands were certainly *not* favourably affected.

In one case, given in detail, in which the latest Pasteur Institute serum was used, the patient was not benefited in any way. (This serum had the guarantee of M. Roux and M. Yersin.) On the contrary, fresh buboes appeared, and the primary bubo became larger, more inflamed with increased surrounding oedema, and the little patient died. This patient was injected exactly 42 hours from the initial rigor, had a full dose of 40cc—a large quantity for a child 4 years old—It was not a severe type of the disease, but in every way a most suitable case for curative serum treatment according to the dicta of M. Yersin.

The serum was perfectly innocuous and unirritating. Two patients developed temporary urticaria, and one slight synoritis of one knee joint, after injection.

In cases that recovered, convalescence was no quicker than under ordinary methods of treatment, and suppuration of the inflamed glands, if they had been previously irritated, was not prevented.

Patients once put on serum treatment got no other drugs except sleeping draughts or purgatives as occasion demanded.

The general mortality was slightly better than under hospital routine treatment, in the proportion of 56·5 to 64·5, but in the latter were 66 moribund on admission; and if these 66 are excluded (and 28 cases treated otherwise), the proportion of deaths amongst M. Yersin's cases to hospital cases stands at 56·5 to 33·5 per cent. of cases treated.

Case No. 1 in the series had hypostatic pneumonia and had been ill four or five days when injected. None of the others had complications at the time the serum treatment was begun. The cases generally were of the ordinary mild type, and the last of the series *specially selected for early treatment* show no favourable results over those treated at a later stage of the disease. If anything, serum cases received more nursing and general attention than other cases.

No. 13 in the series had recurrence of the urticaria on and off up till two months after recovery.

APPENDIX III.

Plague Mild, Ordinary Type : Recovery.

Registered No. 352, Hindu, male, aged 14 ; occupation, school-boy ; ill one day ; residence, Dadur ; admitted 11th April 1897 at 1-30 p.m.

Patient was quite well during the day of the 10th instant, and at 10 a.m. got into the train to go on a journey, and at 11 p.m. on the 11th his temperature was found to be 106°F. ; some delirium ; tongue furred and bowels constipated ; and he was sent to hospital.

On admission, temperature 102.4° F. ; pulse 138 ; respiration 40 ; slightly delirious. Tongue coated with thin silvery white fur, red at tip and edges. No injection of conjunctivæ. Boy intelligent and conscious when spoken to sharply. Shivered and vomited twice at 10 p.m. on 10th in the train.

Present state on 12th April at 8 a.m., temperature 105°F. ; pulse 140 ; respiration 36. A fairly well-nourished, bright intelligent boy ; seems rather quiet and disinclined to talk ; answers questions very slowly and seems dull of apprehension and weary.

Face quite normal, eyes half open, mouth wide open, gums slightly spongy pupils normal, conjunctivæ not injected, eyes slightly suffused. Looks prostrate and stricken. Skin hot and dry, with urticarial eruption, on neck and shoulders, but no visible abrasions or wounds. Dorsal decubitus.

Tongue evenly coated with white, putty-like fur, edges clean. Pulse 140, soft and compressible, and want of sharpness in the beat. Liver and spleen, heart and lungs normal, and abdomen soft. Buboës in the right femoral and right inguinal region : the former vertical, the size of a bean, well-defined, movable, tender, and with little œdema surrounding it ; the latter ill-defined, oblique, hard, matted with surrounding œdematous tissues. Skin over buboës hot and tender. Patient complains of headache, giddiness, weakness, and thirst. Buboës appeared at 5 a.m.

On 13th temperature 104.4° F. ; pulse 140 ; respiration 32. Slightly delirious, did not sleep more than two hours. Appetite good and tongue cleaner. No pain in bubo. Perspires slightly.

On 14th temperature 101.6° F. at 2 a.m. ; pulse 74 ; respiration 30 ; and at 8 a.m. he looked bright, conscious, and intelligent. Tongue less furred, bowels moved four times with gurgling and griping after calomel and jalap purge. Motions greenish and bad-smelling. Urine copious and natural. Pulse slow and regular, conjunctivæ not injected. • Seems deaf. Slept well. No delirium.

On 15th temperature 102° F. ; pulse 108 ; respiration 34. Tongue cleaner. Buboës less tender ; sleepless ; vomited once after jalap powder ; bowels constipated. Complains of weakness, headache, and want of sleep.

On 16th at 10 a.m. temperature 103° F. ; pulse 108 ; respiration 34. Buboës painful and tender larger, and ill-defined. Injected 50 minims of liq. perchloride hydrargyri below the buboës. Tongue furred, yellowish brown, dry. Eyes normal. Breath sounds harsh. Rash on neck and shoulders like urticaria and prickly-heat. Slightly delirious and incoherent. At 5 p.m. temperature 105 ; pulse 132 ; respiration 48. Tongue dirty, gums not swollen or spongy, nor breath fetid. Restless ; wandering at times ; thirsty ; no pain in the head ; eyes normal ; no pain on taking a deep breath. Heart and lungs show no signs of involvement by disease. Upper inguinal gland on right side larger, harder, and very tender.

On 17th at 8 a.m. temperature 101.2° F.; pulse 132; respiration 42. No headache, skin moist, slept well. No salivation. Vesicular and pustular rash on neck, back, and shoulders. Buboës less indurated, not painful, or tender. Drowsy and dazed-looking. No delirium, taste sweetish. Rash disappeared from right side, still present on back, forehead, neck and shoulders. Anæmia present, tongue clean at forepart, pulse regular, full; respiration easy but rapid. At 5 p.m. temperature 102.2° F.; pulse 96; respiration 30. Tongue clean. Convalescent on 18th. Temperature 99.4° F.; pulse 96; respiration 26. Glands swollen. At 8 a.m. on 19th temperature 99.2° F.; pulse 96, quite well. No pain anywhere, appetite good, slept well. Bowels moved four times in past 24 hours—semi-solid natural motions.

At 8 a.m. on 19th the notes read: temperature 99.4° F., pulse 98, respiration 22. Slept very well, quite conscious and intelligent, rash disappeared, skin soft, moist, and slightly perspiring. Tongue clean. Talks, looks about him, and takes an interest in his surroundings. No thirst or headache complained of now. Buboës thin, flat, waferlike nodules, not tender. At 5 p.m. temperature 99.2° F.; pulse 96; respiration 20. Slept during the day, is weak and anæmic. Skin normal. Tongue quite clean; motions three in 24 hours, of natural character. Feels and looks quite well.

On 21st temperature 99° F.; pulse 90 to 96; respiration 20 to 22. No headache. Tongue quite clean. No rash. Buboës just tangible. No salivation, tenderness of gums, or foetidness of breath, no pain or tenderness on meeting the teeth sharply together. Sleeps well, appetite good, anæmia less. Can sit up without the characters (tone, force, volume or rapidity of the pulse) being altered materially.

Discharged on 25th April 1897. Rash gone, buboës disappeared, induration, at their site quite absorbed.

Plague with Delirium, Stupor, Coma and Death on 7th day.

Register No. 370, Jew, ill one day, Aaron Solomon, age 33 years, dealer, admitted 16th April 1897 at 1 p. m., died at 3-40 p. m. on 22nd April 1897.

Patient came from Alibag to Bombay on 16th April. His illness began at 4 a.m. on 16th with shivering, fever, and vomiting. The day previous he had been quite well, and not in contact with plague cases. No dead rats had been seen in his house, but some cases of plague had been in the neighbourhood lately. He was restless, irritable, sleepless, had headache, severe and frontal, constipated, skin hot and dry, much thirst and what he terms "staining" of the eyes up till 8 a. m., when he felt burning pain, swelling and tenderness in the right groin, and came to hospital.

On admission at 1 p. m. on 16th his temperature was 103° F., pulse 108, soft and compressible, respiration 30. Tongue covered with white fur, bowels constipated, conjunctivæ injected, pupils normal, skin hot and dry, and urine febrile in character and diminished in quantity.

Present State.—16th April 1897, at 8 a. m. Temperature 104.6° F., pulse 108, full and bounding, respiration 36, irregular and sighing. Patient is a strong, well-developed young man with a peculiar anxious, apathetic aspect. He lies on his back, is dull and quiet, conscious when roused, but answers questions very slowly, seems wearied and unable to fix his thoughts for any length of time on any given subject. Left to himself he scarcely speaks to his friends, lies in a stupid yet restless state, drawing his legs up towards his body and shooting them out full length again, rolls his head on the pillow, moans, sighs and asks for water frequently. He is irritable, dazed, with staring, startled look. Eyes half open, winking seldom and imperfectly. Complains of severe frontal headache, constipation and thirst. He

vomited bilious matter twice this morning, and his bowels were moved twice after calomel and jalap. Skin hot and dry; breath foetid; a peculiar earthy smell from the person on turning down the bed clothes; tongue furred in the centre, clean and red at the tip and edges. Tongue large, rather dry, and teeth—indented. Fur thin, whitish, even layer, as if moist putty had been smeared over the dorsum of the tongue and adhered to it. No eruptions or wounds discovered. Liver and spleen not felt. Heart and lungs normal. Abdomen flaccid, bladder not distended. Extremities burning hot. No delirium at present, but he has been wandering and muttering during the night, and slept very little, if at all. A bubo is seen and felt in the right femoral region; almond size, exquisitely tender, isolatable, horizontal in situation. Skin over bubo hot and burning. Pulse now 110 to 120, full and bounding. Feels giddy when he tries to sit up, against which he has been warned. Put on full doses of mercury solution. At 5 p.m. the same day, temperature 104° F.; pulse 120, respiration 36. Delirium and stupor and jactitation marked. 50 minims of liq. hydrargyri injected below inflamed gland.

At 7 a.m. on 17th April, temperature 103.2° F.; pulse 120; respiration 26. Tongue with light white fur on dorsum, increasing towards pharynx and fungiform papillae showing. Cephalalgia less. Passed six bad-smelling, greenish motions after calomel and jalap purge, vomited four times. No sleep during the night but no delirium; voice low and weak. Feels prostrate, irritable, and depressed; tosses his limbs about, looks weary, groans, sighs and answers questions with difficulty, and appears to be deaf. Bubo tender, and oedema over it obscures its outlines. At 4 to 6 p.m. 17th, temperature 104° F.; pulse 132; respiration 26. Jactitation and "typhoid state" marked. Eyes closed, muttering delirium, picking and fumbling at the bed-clothes. Conscious for a short time when roused, but soon lapses into delirium and incoherence. Breath and body odour foetid. Heart sounds normal but accentuated. Slight dry cough, pain and tenderness in right flank, signs of hypostatic congestion discovered at both bases. Turpentine stupes and free stimulation ordered. Bowels constipated, urine small in quantity with 1st albumen. Vomits frequently, headache complained of, on enquiry. Body hot, tongue furred, does not evince interest in anything when awake.

On 18th, temperature 102.6° F.; pulse 108, weak and compressible; respiration 36, sighing and irregular. Headache gone. Slept not more than one hour during the night. Bubo not painful, but tender, and size of almond, surrounding oedema greater. Tongue yellowish white, furred, and drier. No sordes on lips or teeth. Noisy; busy delirium during the day. Not so restless. Giddiness, thirst and weakness complained of when roused to answer questions. Causing the patient to sit up with support made his pulse 130 to 140 and weak and irregular, rapid and compressible.

On 19th, temperature 102° F.; pulse 144; respiration 48. Eyes half open and seldom closed; stupid, dull, apathetic. Tongue cleaner, but drier. Sordes on lips and teeth. Headache less. Slept towards morning with the aid of camphorodyne and bromides. Less restless. Delirious at times. Prostration increased. Bubo harder and larger, measuring 1½" X 1" and very tender.

On 20th, temperature 101.6° F.; pulse 108, very weak, almost thready; respiration 36. Breath sounds at bases obscured by mucous rales in part. Tongue clean at sides, but fur thicker in centre of dorsum. Skin clammy, extremities cold. Expression stricken. Weary and disinclined to talk. Drowsy, with dorsal decubitus. Bubo larger and more oblique and very tender. Slept very little. Delirious on and off the whole day. Bowels constipated, urine passed naturally at 4 p.m.

On 21st, temperature 103° F.; pulse 120 to 130; respiration 48. Passed a restless night. Thirst and delirium markedly increased. Skin perspiring; extremities cold. Bubo larger, harder, more distinct. Patient very drowsy and restless. This evening stupor and complete unconsciousness came on with sighing, irregular respiration, cold extremities, low muttering delirium, and general symptoms of the so-called "typhoid state," from which, in spite of vigorous efforts and treatment, he never rallied, and died on the evening of 22nd April 1897.

Plague, Sudden Collapse and Death.

Register No. 396, Hindu, male, age 22, labourer, admitted 22nd April at 8 a.m., died at 6 p.m. on 23rd, ill 2 days.

Case from Bhoiwada, house No. 134. There had been no plague in his ohawl. On the 22nd at 3 p.m. he became ill with headache, shivering, vomiting and constipation; and he lay down, became unconscious and stupid, and knows not how he got to hospital. At 9 a.m., on 22nd, temperature 103·8° F.; pulse 128; respiration 36.

Present state.—A strong, muscular man with dull stricken look. Eyes closed, mouth open, foetid odour from skin and breath; lying on his back. Eyes suffused and injected, especially at both canthi, when uncovered. Patient unconscious and drowsy; pupils normal. Tongue thickly coated with even putty-like fur, red at tip and edges. Body and extremities hot and dry, skin of face clammy, refuses food. Dorsal decubitus: irritable and restless when touched; breathes quietly. Liver in the nipple line extends to the upper margin of fifth rib. Cardiac impulse normal in position, can be seen and felt, sounds ruffled, no murmurs. Breath sounds harsh in front, and at base of right lung numerous mucous rales detected.

Liver and spleen not felt in abdominal regions; abdomen flaccid. An old scar (one week's duration?), on right knee, no eruptions or wounds found. A bubo is felt on right femoral region, size of a walnut, very tender as he evinces when it is touched; a good deal of œdema around, and skin movable over it, but hot and burning.

Small, shot like, but soft and non-tender glands felt in left groin; none elsewhere. Temperature 103·4° F.; pulse 120—132; respiration 48 at 4 p.m., on 22nd pulse soft and very compressible, patient in same state as noted in the morning, unconscious and delirious.

On 23rd at 7 a.m., temperature 104·6° F.; pulse 120—130; respiration 60 and he became conscious at 5 a.m., slept till roused, and then gave an account of his illness. Is intelligent, shows his tongue which is furred, white, and large and moist. He complains of pain in the right groin and headache chiefly. Feels prostrate and weary. Eyes clear, not injected, but suffused and muddy looking, pupils widely dilated. Bowels constipated; passed urine this morning.

Bubo more distinct, harder, and very tender; seems convalescent. Blood cultures on agar disclosed the presence of specific plague bacilli and the case was watched with great interest, as all such blood infected patients had hitherto died.

At 3-30 p.m., on 23rd, he was conscious and intelligent. Took nourishment and wanted to sit up in bed. Temperature 104° F.; pulse 128; respiration 40; and looked doing well and as last noted.

On visiting him again at 5-30 p.m., however, a marked and sudden change in his condition was apparent, eyes greatly injected, pupils contracted, breathing, gasping, noisy, hurried, 72 per minute, pulse running, thready, and hardly perceptible. Patient unconscious, collapsed, unable to swallow. Ether was given twice hypodermically, and hot bottles and turpentine stupes applied, but all were of no avail to rouse the patient from his state of stupor and coma, as he expired at 6 p.m. the same day.

Plague simulating, Enteric Fever.

Register No. 469, Sister E, age 45, European, ill since 2nd May, when she had a rigor at noon whilst at work in the Plague Hospital where she has been doing duty for nearly 6 weeks. She had to give up her work owing to giddiness, trembling, chilliness, headache, repeated vomiting of bilious matter, and prostration. The same symptoms were repeated on 3rd instant, especially vomiting, so that she could not retain her food, and she felt sleepless and was very restless and depressed. On the 4th diarrhoea of a thin, yellowish foetid, watery character came on, and she had six such motions in the 24 hours with much griping and gurgling. She was slightly delirious, had fever, and repeated vomiting, and nausea was constantly present. She was kept under observation at Mahim Hospital and sent to Parel under suspicion of developing plague.

On admission on the 5th, her temperature was 104·6° F.; pulse 144; respiration 36; tongue covered with a light yellowish brown fur, moist, tip and edges clean. Skin hot and clammy. Bad odour from breath and peculiar heavy earthy smell from bed-clothes when they are turned down. Headache, frontal or vertical in seat, complained of very much. Patient is drowsy, wants to sleep, but cannot. Heart and lungs normal. Liver and spleen normal. No eruptions, wounds, or buboes. Bowels moved three times to-day, thin, yellowish, and very bad smelling. Complete anorexia; vomiting abated under treatment. Patient looks and feels ill. Eyes not injected, abdomen tympanitic, and tender, and gurgling detected in various parts not confined to the iliac fossa. Pulse large, soft, and compressible. Decubitus dorsal. Diaphoretic mixture, stimulants and quinine prescribed and the patient kept in a separate ward under observation. On 6th, temperature 104° F., pulse 120, respiration 30; slept fairly well with a sedative draught. Headache less, very prostrate, tongue large, soft, teeth-indented and covered with dry yellowish-brown fur except at edges, which are red and clean. Bowels moved three times; motions as before in appearance. Dorsal decubitus and sinking down in the bed; no delirium. Enteric spots looked for, but not seen; the same evening temperature 102° F., pulse 130, respiration 30; prostrate, and complains of aching lumbar pain and pains in the limbs. On 7th, temperature 99° F., pulse 120, respiration 30; slept well; bowels moved six times. Camphorodyne and intestinal antiseptics given, and diet as in Enteric being continued; no other change in her condition noticeable. General appearance of "typhoid state." On 8th, temperature 103° F., pulse 120—132, respiration 24; nothing abnormal in chest; skin moist; tongue furred, headache less, slept a little, but had delirium between sleeping and waking periods. Bowels moved three times during the night distinctly yellowish and suggestive of enteric motions, very foetid, acid in reaction; complete anorexia, and some incoherence present. Fumbling and picking at bed-clothes.

This evening tenderness is felt at the inner end of Paupart's ligament in the left groin, and she groans when pressed in the left groin. No buboes felt however in this groin or elsewhere; a vesicle has appeared on the right loin. Its contents have been examined for plague bacilli with negative results, and repeated attempts by skilled Bacteriologists of the German Plague Mission have failed to demonstrate plague bacilli in the blood of this patient. On 9th, temperature 101·6° F., pulse 144, respiration 36 at 8 a.m., and she is very prostrate. Tongue more furred in the centre, no headache; three motions as before; liver not enlarged nor tender; abdomen distended and tender all over; eyes not injected; pupils normal. Face has a heavy apathetic look; delirium at times and marked incoherence in speech; feels tongue heavy; sighs, groans, sinks down in the bed. No typhoid spots. An enlarged hard linear 3' x 2' ring of inflamed gland tissue felt along both Paupart's ligaments near the inner side of each groin, slightly above the level of the groin and partly extending over the abdomen.

Skin over the swellings dry, hot and tender, and œdema marks the differentiation of the individual glands in the groins; no buboes elsewhere; blood cultures sterile.

On 10th, at 9 a.m., temperature 103.2° F., pulse 144, respiration 48; stupor deepening into coma present. Very prostrate. Tongue furred. Sordes on lips. No sleep owing to delirium during the night. Vesicle the size of a pea has broken down into an ulcer on right loin. Its contents sterile. Pulse very weak, running in character. Eyes half open, expression vacant, incoherent and delirious. Vertical cephalalgia. Lethargy. Buboes in both groins, thick and brown and very tender, with considerable surrounding œdema. Bowels moved once and urine passed involuntarily in bed. Vesicle surrounded by red inflamed spots; mental hebetude marked.

On 10th, at 6 p.m., temperature 103° F., pulse 140, respiration 48; tongue dirty brown with fungiform papillæ prominent. Prostrate and comatose. *Sub-sultus tendinum* present. Passed 3 motions involuntarily in bed, very foetid, thin and yellowish. Patient continued to grow worse and died at 11 p.m. on 11th May, not having recovered consciousness during the last 24 hours.

No bacteriological examination of the contents of the inflamed glands could be obtained.

Plague-like Remittent Fever at first, late appearance of Bubo and Broncho-Pneumonia.

No. 355, female, aged 22, from Dadar, admitted 12th April 1897, at 11-30 a.m.

Became suddenly ill at 8 a.m. on 11th April with vomiting, headache, chilliness, and fever, but had no inflamed gland. Her grandmother had died of plague in the same chawl, and nine or ten dead rats had been found there; and during the last month or so nine people had died of plague in the same chawl.

Present state—Patient is a well-nourished young unmarried woman. Slightly drowsy. Conjunctivæ not injected. Pupils normal, eyes suffused. Tongue coated with thick white patchy fur at sides. Pulse 112, soft and compressible. Skin hot and dry. No delirium, slight frontal headache. Restless and drowsy. Dull and apathetic. Did not sleep last night, was incoherent, and rambling in low muttering state.

Nothing abnormal in liver, spleen, heart, lungs or abdomen. No rash, wounds, abrasions or buboes can be found, and she remained in this state up till the 14th at 11 a.m., when temperature 104° F., pulse 120, respiration 32, and a well-defined bubo can be seen and felt in the left axilla. At 4 p.m. the bubo was larger, harder, size of walnut or small orange, on the pectoral margin of left axilla, very tender and well defined.

Patient anæmic with respiration decubitus, restless, drowsy, and slightly delirious. Tongue with thick yellowish-brown patchy fur. Skin of body hot and dry, extremities cool.

Eyes partly closed, mouth wide open. Expression vacant.

Pupils contracted and eyes turned upwards and inwards. No sordes. Abdomen flaccid. Liver and spleen not felt. Respiration deep, pectoral in type. Feels thirsty, drowsy, and complains of pain in the left axilla. Patient has not menstruated for the last seven months. Breath sound, normal.

* On 15th in much the same state as last noted. Restlessness, jactitation, low muttering delirium, and no sleep at night. Bowels constipated. Tongue furred. Teeth covered with sordes, and lips dry.

On the 16th at 8 a.m. a bubo noted along the anterior border of the right *trapezius*, isolated, bean-like and very tender, also two small buboes in the submaxillary region on right side. The whole body pains. No delirium at present, but slight incoherence. Headache temporal in situation complained of and much thirst. Tongue clearing in patching in centre and front, leaving raw, red nonfissured areas. Left axillary bubo larger and very tender with oedema, obscuring its limits. No complications. Patient menstruating for the first time since September last. Injected 60 minims of hydrarg perchlor. at 10 a.m. in left arm below bubo. Same day at 5 p.m. temperature 104.6° F.; pulse 120, very compressible, respiration 40. Cephalalgia frontal and severe. Bubo less tender. Patient sleepless, thirsty, without appetite. Motions and urine passed naturally. Tongue with thick brownish-white fur, chipping off in large flakes, leaving raw red areas.

At 9 a.m. on 17th, temperature 105.4° F., pulse 120, respiration 36. Breathing hurried and painful in right side. Slight cough and *mucoserous* expectoration, tinged with blood at times.

Physical signs of broncho-pneumonia in patches. Patient prostrate, sighing, and moaning, and delirious at times. Conjunctivæ injected, especially at canthi, more delirious at night. No sleep. Constant cough. Menstrual discharge profuse; foetid: does not contain specific micro-organisms of plague.

At 7 p.m., temperature 105.4° F. (fell to 102° F. 6 a.m. when broncho-pneumonia was developed); pulse 130; respiration 36, quick and shallow. Pain in right side. Expectoration and cough constant. Sputa yellowish-red at times. Tongue with two patches of raw red appearance; the size of sixpence each. Drowsy, slept with delirium between, for half an hour at most; very thirsty and prostrate. Anorexia complete. Unconscious and with low muttering delirium, but can be roused to answer questions. Bowels constipated, urine passed naturally. Very anæmic. Left axillary gland very tender.

On 18th, cough and pain in chest markedly increased. Tongue and general symptoms and signs unimproved. Menstruation profuse and still foetid in spite of frequent injections of Condy's fluid, borax lotion, and sublimate. Patient was found sitting up gasping for breath and the pulse became small, short, rapid, irregular, and almost indistinguishable.

On 20th, the notes read—Prostrate, anæmic, unconscious and delirious. *Mucous rales* at both bases behind. Expectoration mucopurulent and blood tinged. Respirations, gasping irregular, 48 per minute; in the evening 66 per minute. Bubo exquisitely tender and oedema obscuring it.

On 21st semi-conscious. Respirations, gasping and gurgling, 66 per minute. Eyes staring, injected, wide open with pupils dilated. Much jactitation. Immense swelling of tissues around neck, under-jaw, obscuring features. Tongue crusted brown, sordes on lips and teeth and "typhoid state" generally, and death with stupor and profound coma at 2-30 p.m.

Plague complicated by Pregnancy; Death on 22nd day.

Register No. 374, Hindu, female, age 30, coolie (laborer), admitted 17th April 1897 at 2 p.m. from Sewri; ill one day.

History on the night of 16th.—Patient had an hysterical fit followed by shivering fever, headache, vomiting and delirium. Bowels constipated three days, and buboes appeared at 10 a.m. on 17th in the left femoral region. Present state, 5 p.m. 17th—Dorsal decubitus; eyes suffused and muddy. Eyes and mouth open; patient can answer questions incoherently; seems in a state of *delirium tremens*. Tongue coated with thick even white fur increasing towards the back. No sordes. Skin very hot and dry, temperature 105.4° F., pulse 144 full and bounding, respiration 60. Liver and spleen not enlarged. Heart and lungs normal. Uterus felt two fingers breadth below umbilicus. Belly painful, and pressure over uterus causes her to screw up her mouth and eyes as if in pain, and she does this at times when left alone, possibly from initiatory uterine contractions. Uterus tender, but rhythmical contraction not made out. Patient pregnant six months. Bubo the size of a haricot bean in left of Scarpa's triangle at its upper and inner part, very tender, with surrounding cedema. Patient feels thirsty and complains of headache when roused. A vesicle on dorsum of left foot, very tender, size of two-anna piece. No eruptions on 18th morning. Temperature 103.2° F., pulse 116, respiration 46. Tongue furred, delirious, pain in abdomen, eyes injected, gland tender with increased soft cedema around. Bowels moved twice. Pulse soft and compressible, laughs senselessly. Talks incoherently. Busy delirium present. Says she has no headache, but belly pains at times. 18th V.—temperature 103° F., pulse 120, respirative 46. Delirious, restless and laughing in a pleased unconscious manner. Eyes injected and open, pupils normal. Bubo larger, walnut size, hard and very tender. Morphine $\frac{1}{4}$ gr. given, and opium 2 grs. as uterus was tender and contracting rhythmically. Aborted at 5 p.m. Fetus six months, examined at 6 p.m. by German Commission experts who did not find plague bacilli in its tissues or blood. The mother's blood gave nacio organisms by cultivation on agar. Bacilli found in vesicle on dorsum of left foot. On 19th morning temperature 102.4° F., pulse 130—140, respiration 54. Tongue covered with dirty brown dry fur. Busy delirium and carphology. No sleep. Pain in abdomen. Eyes injected, pupils normal. Abdomen distended and very tympanitic. Jactitation. Lochial discharge not foetid. Injections of Condy and boric used three times daily. Bubo size of hen's egg with increased surrounding cedema, and very hard and tender. Urine passed unconsciously in bed. Liver dulness obliterated. 19th V.—Temperature 102.6° F., pulse 132, respiration 36. Quiet and sleeping. Abdomen very distended, obliterating liver. Dulness. Passed one motion. Tongue cleaner. Eyes less injected. Seems sensible when roused, but soon lapses into busy delirium like that of *delirium tremens*. On 20th morning temperature 100.6° F., pulse 120, respiration 48. Seems conscious and better. Tongue clear, bowels regular; lochia not offensive.

20th V.—Temperature 100.6° F., pulse 108, respiration 48. Takes food, slept five hours, groans and moans in her sleep. She is conscious and intelligent. Passed two very offensive motions and vomited twice after food. Discharge suddenly stopped.

On 21st—24th. Restless, refuses food. Tongue furred at back. Eyes injected. Babbling delirium. Abdominal distention disappeared. Bubo smaller and less painful; and she seems worse generally.

On 25th morning temperature 100° F., pulse 90, respiration 36. Prostrate, restless; has to be fed by enemata as she refuses food, &c. Does not sleep. Tosses about in delirium, at times quiet, busy and rambling. Bubo tender; abdomen flaccid. Lochia again appear and offensive. Uterus washed out with 1 in 5,000 sublimate. Passed three very offensive motions.

25th V.—Temperature 100.8° F., pulse 108, respiration 30. Conscious, takes food, lochia without smell.

On 26th—Slept; skin cool; conscious; takes food. Passed three offensive motions, and in the evening temperature fell to subnormal, lochia ceased and pulse became 100, very weak and thready. Respiration 40—48. Vesicle on left foot has become an ulcer 4 annas in size.

From 26th—29th was quiet and intelligent; slept with morphine injections. Tongue dry with brownish yellow fur and flaky patches peeling off it. Recognises friends. Leucorrhœa. Feels better and stronger. Bubo larger and more distant from the subsidence of œdema. Takes food. Bowels regular. Urine passed.

On 30th, temperature 103.8° F., pulse 120 soft and very compressible, respiration 48.

No sleep the previous night. Wandering in busy delirium. Tongue flaky, very weak and prostrate. Complete anorexia. Bubo smaller and less tender.

1st—4th May. Prostrate and delirious. Abdomen again distended. Urine has to be drawn off by catheter. Passes motions involuntarily which are very foetid. Vomits food, milk and bilious matter.

Temperature 104.4° F.—103, pulse 110—120, respiration 44—54, and patient continued to lose ground, became exhausted, developed a bed-sore on the right sacrum, had very foetid breath, sordes on lips and teeth. Pulse 160, very weak and running and not to be felt at last; respiration 60—66; and temperature ran up to 107.2° F. just before death at 4 p.m. on 8th May 1897.

For the septicæmic condition, which frequent lavage of the uterus and vagina by antiseptics failed to prevent, quinine in large doses, salicylate of soda and boric acid were tried and liq. hydrarg. perchloride in full doses.

Plague.—Pneumonic Variety; Death on third Day.

Register No. 350, male, aged 25, sepoy of 4 years' service, employed as cook orderly for six weeks in Parel Hospital. Attacked 10th April at 8 a.m.; admitted on 11th at 7 a.m., when disease was diagnosed by microscopic examination, and culture growth as agar on plague pneumonia. Died 13th April at 12-15 a.m.

History.—Suddenly attacked by giddiness, head-ache, repeated vomiting, fever, prostration, and delirium at 8 a.m. on 10th instant, when temperature was 102.2° F., pulse 132, respiration 28 as taken by the Hospital Assistant. At 9 a.m.—Present state: Eyes markedly injected. Skin very hot and dry, jactitation marked. Delirium of a noisy character present; wants to get up out of bed and run away and is restrained with difficulty. Can be roused and his attention arrested momentarily. Says he has severe headache, frontal in site. Talks incoherently and only partly utters sentences and words.

Complains of pain in right side of chest (4th—9th rib) between mid axillary and anterior axillary lines where dulness and moist crepitation is detected in small patches, not more than the area of the palm of one hand being involved, and that only in some parts. Tongue coated with brownish white fur, red at tip and edges. Tongue large, teeth—indented at sides and moist. No sordes, dorsal decubitus, and prostration marked. Expectoration and cough frequent, sputa sero-mucous, frothy, and tinged with blood. Cover-glass preparations showed numerous plague bacilli present. Pulse

soft, full, but remarkably compressible. Bowels constipated, urine passed high colored febrile, deficient in chlorides and slightly albuminous. Pupils dilated. Eyes always open, fixed, and staring. Mouth half open. No buboes discoverable anywhere. No rash or wounds. Temperature (at this time) 105° F., Pulse 128, Respiration 28.

On the 11th morning—Slept only 1 hour during the night, very delirious and almost uncontrollable. Cough and expectoration constant; pain in right side, head-ache, and thirst complained of greatly.

Physical signs of pneumonia scattered and not well marked. Finger pricked and blood examined and bacilli found in it.

Tongue brown and dry. Skin very burning hot. Perspiring about head and neck. No buboes found. Eyes markedly injected. Very incoherent. Floccitation and carphology present and great jactitation.

On 12th no change; all symptoms aggravated. No buboes; prostration and "typhoid state" increased. Expectoration as before, and cough more frequent, if possible, than previously. Sinks down in bed, is dull, apathetic, and drowsy. At 6 p.m. collapsed and did not rally till 8 p.m. in spite of ether, hot bottles, stimulants and strychnine; and at 11 p.m. was markedly collapsed; Temperature subnormal; Pulse 148 R. 48. Pulse could hardly be felt, small, very weak and thready; skin of body generally and especially of extremities cold, and death ensued at a few minutes after midnight. No buboes discovered after death externally, but no *post mortem* could be obtained to determine the presence or absence of internal buboes.

The blood after death showed myriads of plague bacilli.

Statistical and Clinical Record of Work done in the Grant Road Hospital during the period of its existence from the 4th of March to the 15th of June 1897 by Dr. A. McCabe Dallas, L.M., L.R.C.P. (Dublin).

401 patients were admitted, 27 of whom were not suffering from plague; leaving 374 actual cases to be reported on.

This number includes almost every variety of the disease, and for convenient reference I have classified the admissions under five sets of tables.

Table (a) exhibits the comparative nature of each form of attack together with mortality.

Table (b) shows how the castes were affected.

Table (c) indicates their occupation.

Table (d)—Mortality returns for age arranged in half decades.

Table (e)—Relative comparison of the sexes.

In table (a) it will be observed that 98 cases were purely of the pneumonic type, 9 were pneumonic accompanied by buboes in various positions, 2 were of the carbuncular type, 2 were apparently free from either bubo or pulmonary complications, while the remainder were entirely of the bubonic variety.

It is unnecessary to analyse the seat of those glands most affected, beyond pointing out that enlargements in the groins and axillas predominated, and from the early history of plagues, the present epidemic appears to show no exception in this respect. If we refer to "Russell on Plague" written anterior to 1840, it will be seen that from 2,700 observations made by him the inguinal eruptions are most common, being more in the right than the left side, proportionately about $1\frac{1}{2}$ to 1. The axillary regions come next in frequency, the right being more often affected than the left, although the difference is inconsiderable. This practically coincides with the observations noted in my hospital.

The ages most exposed to risk range between 20 and 40 years in both sexes. 30 years seems the maximum danger point. From youth up to this figure the disease gradually increases, and having reached its height there, manifests a corresponding decline as the age advances. Plague then may be characterised as more virulent in adult life than at any other period.

Approximately in relation to the sexes, males have been attacked in rather more than twice the number of females, this being probably due to their greater exposure, and partly to the fact that a large number of women and children left the city during the course of the epidemic.

Mortality among females is higher than males.

As regards occupation, no special vocation appears to be singled out. The major portion of the patients being labourers, the death-rate naturally shows a greater percentage in this class.

The first clinical question to discuss is that of a proper scientific name for the disease, which is popularly recognised and understood to mean Plague. In the

nomenclature compiled by the Royal College of Physicians, London, this expression is, I believe, retained, as handed down by the ancients, but since we now recognise the disease as presenting many peculiar aspects accompanied by one special (ante- or post- mortem) indication in the glandular system, it may not be deemed unreasonable to fix a more appropriate name, although this will not alter the nature of an epidemic known to the professional and public mind as Plague. The primary symptoms of this disease are confined to a bubo accompanied by fever ; these are its characteristics, irrespective of the few exceptions met with. There is no other form of fever analogous to this and consequently, in my opinion, it would be scientifically correct to express the disease as "Bubonic Fever" and expunge the term "Plague" as vague, imperfect, and not conveying its true meaning without a prefix. Plague might be used for any epidemic creating a sudden and excessive mortality.

As to the origin of the epidemic in Bombay, bacteriologists have laid down a canon that it is impossible for bacteria to be produced otherwise than from their own species ; and, this being so, only two conclusions can be arrived at, viz., that these specific microbes have been pre-existing in Bombay, and for unknown reasons have been in a state of dormancy, till urged by some unknown factor on a career of destruction ; or else, as seems more feasible, they have arrived by importation just when the meteorological conditions were favourable to development, provided they found suitable media and material for propagation and rapid extension.

The normal condition of a plague wave is from a point south to north or north-west, but the facilities for quick contact with human beings through commerce are likely to cause a radiation, and thus we may have it spreading within a circumscribed distance outside its usual directions. This perhaps accounts for its deviation towards Poona and the Eastern Harbour Ports, while its inclusion at Cutch Mandvi and Kurrachee represents its natural course.

The probability therefore of its spontaneous origin, whether *de novo* or through its development from pre-existing dormancy, is against reason and fact ; so also is its introduction by grain or other means from within Indian territory.

We can only assume that as Plague is present in its epidemic form in some of the China ports, it has travelled northwards through marine communication, and having arrived, possibly in the month of July 1896, the meteorological conditions and other insanitary surroundings were favourable to form a focus for its expansion. The monsoon had virtually ceased at this period. There were the necessary heat and moisture present to encourage its culture, helped by the requisite material within the houses, which, in most instances, were overcrowded, ill-ventilated, deficient in light, and inhabited by a class of persons who are generally opposed to the benefits of sanitation.

I believe rats became first affected within buildings and carried on the infection to drains and other localities inhabited by rodents, and in this way the disease multiplied itself, subsequently attacking human beings. In addition to this means of infection, I am disposed to favour the idea that drains were a contributory cause from pollution by rats and as a receptacle of human excreta, urine, and other contaminated matter allowed to escape from plague-stricken patients owing to their habit of converting their bath-room space into latrine accommodation, or through the washing of soiled clothes containing microbes from excreta or pneumonic sputa. That soil is capable of acting as a resting place for germs is accepted, I presume, beyond doubt ; sewage soil in especial. This fact was noticeable to my mind in

consideration of the beneficial influence which a continuous flushing of the drains (in Mandvi, where the disease first occurred,) by a moderately strong solution of perchloride of mercury appeared to exert, and which tended to minimise the disease. This operation lasted for four months, consuming about 70,000 gallons of the solution, after which the district became the healthiest in Bombay, and any recurrence there resulted through the inhabitants gravitating from surrounding districts while they were in a state of incubation or with the disease upon them. Another source of infection was due to the disease being "air-borne" to a certain degree. I am not aware if any Bacteriologist has been able to detect plague germs in the air, but it is reasonable to argue the possibility of infection by this method. These micro-organisms, whether from dead or decomposed rats, or soil, become released, ascend with the warmer atmosphere from below, and, reaching an upper current, travel with it and are ultimately deposited in a building or a locality. Night-time would foster their movements, or sunless days. Their range of travel is limited, especially if exposed to the sun's rays. This accounts, as it were, for the slow manner in which the whole city became eventually implicated by instalments. Except by pneumonic plague, I do not think infection is spread by human intercourse, and in evidence of this statement,* those most closely associated with the disease, as the working staff, from the medical officers down to the coolies, considering their numbers, enjoyed comparative immunity from infection. Of about 400 people—men, women, and children,—who either visited their sick friends or remained constantly by their bedsides, together with the cases under observation, in not a single instance did any of these persons contract the plague. But one of the ward orderlies doing duty in the hospital became affected through direct contagion in consequence of drinking the remnants of stimulants left in feeding cups by patients who did not consume the whole contents, and most probably after some cup had been in contact with the mouth of a plague pneumonic case. His was a severe type. Being relieved from duty at 7 a.m. apparently in his usual good health, he came to me three hours later with a rigor on, congested conjunctivæ, the early signs of a typical tongue, an expression of fear, frontal headache, with general malaise. His temperature rapidly rose to 105·4, and there were no indications of any gland being affected. The same evening some blood was drawn from one of his fingers, and it demonstrated the presence of bacilli. During the night he complained of acute pain in the right axilla, and a distinct glandular enlargement could be felt next morning. There was no lung complication, so that the symptomatic invasion preceded the bubo. During the early hours of the second morning he sat up and ate a plateful of food brought in surreptitiously by his wife, and shortly afterwards expired suddenly.* The fact of bacilli being detected almost immediately in the blood prognosticated an unfavourable termination. Here we have a case absolutely free from premonitory symptoms in a disease so appalling in its nature and so frequently fatal in its consequences, which seems to correspond with Bulard's description (*Dublin Journal of Medical Science*, Vol. XIII), wherein he declares that "plague has no premonitory symptoms." This, however, is not true in all instances. It is so far correct, that often there appears to be no warning symptom such as is found in exanthematous fevers generally. I would lay stress on the infectious disposition of pneumonic plague and its deceptive character to the inexperienced, since, in the absence of any external glandular swelling, such a case might be mistaken for ordinary pneumonia or broncho-pneumonia, whereas every particle of sputa escaping is really a nursery of bacilli in itself. In this form patients would probably be permitted to travel and convey the infection to any distance. During the early months of the outbreak we were really ignorant of this pulmonary complication and confined our attention to the presence of a bubo in some locality or other. At the same time, if I remember correctly, the deaths from respiratory diseases had considerably advanced, and, in consequence of this

* See page 140.

ignored, we unconsciously were allowing deaths to remain unreported, which were no doubt attributable to plague. In an old thesis I possess on plague, the pathological changes in the lungs are fully described, but no importance was attached to the result as an infecting medium. It states :

"The lungs have an inflammatory appearance and are engorged, or they may be of a deep black or livid colour, with their vessels distended by a thick dark-coloured blood, and their substance softened, in some instances chequered, by livid stripes or patches, swelled or enlarged so as to project occasionally from the chest."

No notice appears to have been taken of the condition of the glands in the lungs.

It is possible, however, where death takes place rapidly in primary pneumonia, that there may be no noticeable enlargement of the glands; but where this was absent, I think, if a careful search were made, it would be found that some other gland had become affected. In Table A it will be noted that 34 pneumonic cases had a glandular accompaniment in some region or other, although it is correct to assume that 75 per cent. of these 34 cases had secondary pneumonia, taking their origin in hæmorrhagic stasis, and proceeding to inflammation through the immediate composition of blood and the low vitality of the individual.

The next interesting topic to discuss is the mode by which the bacilli gain an entrance into the system and produce the disease.

In the face of all the expert opinion recently in Bombay, this matter is not so simple as first appears. If we accept the current conclusions arrived at that three sources offer this opportunity, there would be no reason for further argument, *viz.*, through wounds, abrasions or other openings of the skin or mucous membrane, through the lungs, or by way of the alimentary canal.

To take the inoculation cause first—if we believe it—this is easily explained; and for our purpose we will take an inguinal case.

An open surface exists about the foot or ankle. It must be an oldish wound, abrasion or ulcer, as a new wound or cut is practically sealed by serum—coagulation on its surface, likely to exclude any microbe from entering or being absorbed.

The finest lymphatic vessels, or capillaries, exist as a plexiform network in the connective tissue. They are, therefore, in contact with this open space; these capillaries as they diverge or recede from their superficial position form small channels, which from anastomoses become larger till they converge towards the deeper glands situated in the femoral or inguinal region. The microbe is supposed to be absorbed by the capillary system conveyed along the channels with the lymphatic fluid till it reaches a gland where it (or they) becomes located. Here its fission or multiplication begins, and during this process a toxine is produced, which is eventually set free and carried on in its direct course with the lymphatic fluid till it gets into the general circulation, and septicæmia results. Meanwhile the gland has altered. There is tension, congestion, infiltration, serous or hæmorrhagic, into its substance, variable enlargement, more so below than above, with acute pain. If more than one set of glands are implicated, it is probable that the second or third sets are a secondary sequence, arising from a primary gland becoming infected—that is, through the medium of the toxine, and not actually by the presence of microbes. In only a small portion of those attacked are bacilli found in the blood, and if they are, the possibility is that they escape from the gland by exosmosis when there is great hæmorrhagic infiltration through the walls of the veins lying in proximity or contact with the diseased gland. The presence of these bacteria prognosticates an unfavourable issue, especially if they are found early with a high

temperature. Bacteria of plague would always be found in the blood within, especially the blood of the liver and spleen and other similar glandular organs, and thus indicate completion of the septicæmic state. If taken in by inhalation, this would lead us to conclude that the pulmonary lymphatic corpuscles would absorb the microbe, convey it to an organised gland, where a surrounding pneumonic patch would follow, or, if by the alimentary system in addition to the lymphatics, we have an analogous composition in Peyer's patches to act as a repository for their reception and fission.

The disease, therefore, being essentially a lymphatic one in its initial stage, our theories (or facts) are concentrated in tracing the origins of these microbes directly into the lymphatic system as a direct source of their future contamination.

Against this we have to consider whether it was found that rats become affected by inoculation. I observed a very large number without forming that opinion.

It is inconceivable to suppose that out of the numerous cases of the glandular form each must have been affected by inoculation. Not more than 10 per cent. of my 374 patients presented such suspicions, and even when the disease first broke out at Mandvi, and I heard Mr. Hankin propound this view, I was unable to recognise or appreciate the wound and abrasion cause as being responsible for the ingress of the propagator of this toxine, and it appears peculiarly strange that such a huge proportion of the population should suddenly have developed open surfaces, without our having advocated the supply of prophylactics, or aseptic material to protect them from this known source of contagion.

Again, we have the evidence of Galen and others who have noticed that those who had wounds and issues did not fall victims to the disease during the epidemic, and Larrey, who was Surgeon with the French Army in Egypt, expresses a similar opinion, that the wounded actually escaped being attacked although an epidemic was raging, but when their wounds healed they were as susceptible to contagion as the others. In consequence of this observation, he thought that the creation of wounds and discharges would afford immunity—a practice which was adopted by the surgeons in the great London Plague of 1666 and recorded as a satisfactory protective. And, further, we have writers who emphatically note that “inoculation has never yet been satisfactorily shown to be productive of this disease.”

Another theory, however remote, is that the plague bacillus, having some special idiosyncrasy to be domiciled in a gland and nourished in lymphatic fluid, gains an entrance through the lungs, enters the general circulation, and finding the blood-current too rapid, although the material for its propagation is suitable and nearly of the same composition as lymph, is propelled till it is carried into one or more glands by entering their *hilus*, and this may account for two or three glands being simultaneously engaged.

As a further cause of invasion of the disease into a town, it is stated that plague may exist in an unappreciable epidemic form for many decades; then, from circumstances connected with the season which we do not comprehend, so active and potent does the disease become, as to produce an epidemic.

As regards infection by personal intercourse, this is partly explained already: and I believe a person himself uninfected cannot produce the disease in others by being as it were the bearer of it. So well did this appear to be understood in past epidemics of ancient times that people knew no evil consequences resulted from visiting the sick.

As to the predisposing causes, prime of life and robust health offer greater susceptibilities—insanitary dwellings, deficient ventilation and light, dampness in houses and surroundings, exhausting occupations, overcrowding in infected buildings, and want of rest, &c. There is such a similarity in each form of attack that a technical description of one case will suffice to indicate the symptoms observed. First in the glandular variety.

There may or may not be a noticeable rigor—indeed most patients denied this—depression of spirits, frontal headache of a throbbing nature, with a certain amount of giddiness; an exhausted anxious look, while the eye-lids appear heavy and are kept partially closed, giving the eye a dull, downcast, and sleepy expression; considerable restlessness, and occasionally vomiting, or purging, or perhaps both; the excreta being of a bilious kind. Usually, however, there is constipation. If the patient is able to walk, there is a staggering, uncertain movement in his gait. Weakness rapidly increases till the muscular system becomes powerless. He feels faint and has an uncomfortable sensation in the præcordial region, and, in comparison with other fevers, these symptoms invade very early. The countenance gets more haggard, the eyes more sunken and dull, and, if the temperature be high (about 104 or 105), there is invariably some congestion of the conjunctivæ. The skin is hot, dry, and harsh to the feel; the only places appearing to offer any perspiration are the forehead and neck. The tongue is swollen or considerably thickened, covered with a fur varying in colour from white to reddish brown; at times it glistens towards the centre, looking like old mother-of-pearl, the tip and edges are moist, clean and red, this redness being more apparent than real owing to the contrast produced by the fur. The pulse is quick, small and soft, and feels as if there was a want of elasticity in the coats of the artery. The respiration may be short and hurried, the speech is thick or indistinct; there is an indifference to conversation, although there is complete sensibility, and pain is experienced in some glandular region. So intense and acute is this that the very approach of one's hand towards this spot acts spasmodically on the patient. If the bubo has already developed, it is of a red colour, and the deeper this approaches to a purple or livid aspect, the more serious is the prognosis, as such change is no doubt produced by extensive hæmorrhagic infiltration. Suppression of urine may exist, while in colour it does not differ to that passed by those suffering from other fevers. There is a distinct inability to sleep, a craving thirst, and a *persistant desire not to acknowledge being attacked by plague*. After a lapse of 12 to 20 hours, and this in relation to the intensity of the toxine or idiosyncrasy of the individual, the symptoms become more exaggerated. There is an agitation of impending fear, a restlessness, and wish to sit up, a constriction about the chest. An oppressiveness, as if sufficient air cannot be taken into the lungs. A constant change of position, and impatience towards attendants. Sleep is only temporary and unrefreshing. The patient wakes in a dazed condition with hallucinations, his mind wanders, and there may be delirium, and this in proportion to the temperature, subsiding into simple confusion during periods of remission. These symptoms may alternate for two or three days, a regular remission being more favourable than a rapid rise and fall of temperature. Sometimes there is an appearance of coma supervening, which argues an intensity of the disease. If at the end of three or four days the symptoms present no indication of abating and become further aggravated, the exhaustion has advanced, the tongue is parched and tremulous, the fur has assumed a darker hue, the pulse is exceptionally soft, and markedly dirotic, quick and labouring, pupils much dilated, a confused expression of countenance, impediment of speech, so that the patient cannot pronounce words. The muddy aspect of the eyes is peculiarly mixed up with a distinct lustre and continues so irrespective of any symptomatic remission. The tongue has now increased in size, and there may

be a horny cleft down the centre. Vomiting may set in, or a distressing nausea take its place. Costiveness may give way to looseness with black and offensive evacuations, sometimes mixed with blood and passed involuntarily without pain. The hæmorrhage, no doubt arising from the mucous surface of the bowel tends to increase a fatal result, or there may be a fatal and persistent hicough accompanied by extensive tympanitis. Death is usually sudden through heart failure, and frequently this occurs when the patient has not progressed to any alarming degree of apparent danger. At the end of three to five days, if the skin become moistened and the cerebral symptoms abate, the pupils begin to contract, the pulse become slower, and a fall of temperature occur by defervescence, the prognosis has a favourable inclination.

Meanwhile the bubo, which forms a prominent character in the disease, has become more enlarged, tense, hardened, painful, of an obtuse kind. The integumental covering may be in no way discolored, the swelling is visible and is round or oval, and immovable. It is when signs of suppuration are setting in that the discoloration is more palpable. Complete suppuration occurs in from 10 to 15 days under favourable circumstances when encouraged to do so by the constant application of hot poultices, or the bubo may resolve itself by gradual dispersement and absorption, or become indurated.

Highest temperature registered in the bubonic form was 107°6.

In Plague pneumonic the invasion is characterised more or less in a manner similar to the bubonic variety, but there is no external bubo present. A slight cough with a small patch of crepitation is soon detected, or the crepitation may occupy distant spots in one or both lungs, usually beginning behind, and higher up than in the ordinary form of pneumonia. The temperature may be comparatively low at first, and there may not be much difficulty in breathing, or any dyspnoea present, and consequently the difference between the pulse and respiration is not so marked. The temperature rapidly ascends as the pneumonic aspect increases, and there is not the usual sputum of rust-coloured mucus. It has more the appearance of a broncho-pneumonic type, or a sero-mucous fluid, which, when blood-stained, is more liquid and of a lighter colour. This blood seems almost incapable of coagulation. The cough is not troublesome, and if the expectoration exists in quantity, there is a want of effort to expectorate. Exhaustion is more rapid in this form of the disease. Between the pneumonic patches the physical signs may be of a normal character, or of an interlobular form of emphysema occupying the spaces.

Highest temperature registered in this variety, 110°8.

As a rule, if the internal organs have been healthy before the person became infected, there is at most only a slight perceptible enlargement of the liver, and perhaps not of the spleen; both being due to engorgement. The size of the heart has not increased, there are no abnormal sounds or *bruits*, but the natural sounds become muffled. The clear ring of the systole and diastole are obscure.

The urino shows little alteration in its specific gravity. It invariably contains traces of albumen, occasionally hyaline casts, and sometimes red blood corpuscles, or even blood. The nervous phenomena are those usually found in septicæmia, and are in proportion to the rapidity and amount of prostration present.

Petechiæ have been seldom observed, external hæmorrhagic extravasations less so.

In two cases hæmiplegia follows as a sequence to the disease, but in both instances there was rheumatic arthritis in evidence.

In the case of a boy, aged 10 years, who had recovered from the acute stage of an inguinal attack, the liver suppurated. It was incised, and the enormous quantity of 80 oz. of pus drawn off. He survived the operation about 20 days. There were four cases of women admitted, who were two to three months pregnant: two died and two recovered; of the latter class, one was of the pneumonic type, with free hæmorrhagic expectoration. Abortion did not follow in either of them.

Neither did I observe—as is generally reported—that in women the uterus becomes a seat of hæmorrhage supervening upon the other symptoms. On the contrary, some of the cases underwent their catamenial period in a normal manner while barely out of the acute stage.

Where pregnancy is more advanced; from four months and upwards, or where the fœtus is in a viable condition, abortion is sure to occur. I had two such cases and admitted a third where abortion had just preceded admission, and I have heard of other similar results from reliable sources.

There is also a mild form of plague where the temperature does not exceed 100° and is not of long duration, nor very urgent. There is loss of appetite, nausea and want of energy. Skin hot and dry, restlessness with sleeplessness, and never any *delirium*. The tongue, pulse and condition of the eye and countenance are of a modified type. After a few days the febrile symptoms subside, diaphoresis takes place, and there are night rises and morning remissions of temperature. A bubo is present, and rapidly goes on to suppuration, heals quickly; the whole course of the disease ending within 12 days.

There were two cases of plague within my observation in which neither external buboes were detected, nor was there any symptom of pneumonia, but all the other characteristics of the disease were fully manifested. Whether bacilli were present it is impossible to say, as no opportunity offered to obtain them. It is, however, possible that bacilli of incipient energy may have been present to cause a partial development of their toxic influence, but not capable of producing, from some obscure impotency, the intensified form of the disease. This condition of their existence may be partly accepted from the fact that a man was admitted with indications of plague, but without any temperature above normal. His tongue was definite, and the only sign to be relied on. He had mycetozia of the foot. The Russian Medical Officers pronounced it tuberculosis, and it became doubtful whether the case was actually one of plague. A culture was made from material obtained from within the foot, and in course of time it proved to contain plague bacilli. So far as actual plague was concerned, this patient never experienced any symptoms common to the disease. His case is noted in the register of No. 97.

Similarly, another patient was admitted in an advanced state of phthisis with cavities occupying both lungs. On admission he exhibited unmistakable signs of plague, and a pneumonic patch could be detected here and there. He had no buboes. No bacilli were detected in his sputa. He died; a *post mortem* was instituted, and, although the characteristic indications of plague pneumonia were not present, the culture proved the presence of definite microbes. The form of *delirium* met with is either persistent to a fatal issue, or of a passive nature. It arises from meningeal congestion, due to a high temperature or to a poisoned condition of the blood. It is of a low type, never accompanied by violence. At most the patient may endeavour to get out of bed. There is muttering, or incoherent talking, or a fixed delusion, but no furious shouting. In the bubonic form it is invariably more active. The pneumonic variety is usually associated with stupor or sometimes with carphology. Occasionally the patient may be roused out of it, speak sensibly, and relapse again into the same state.

Twenty-four *post-mortems* were made. In 18 the disease was confirmed by the subsequent culture of microbes; in 2 there was some doubt; in the remaining 4 no bacilli were discovered. This result does not, in my opinion, prove these 4 cases not to have been plague. It is known for a fact that, if a case progresses far enough, the microbes undergo dissolution and disappear. Indeed in the bubonic form their disappearance might be said to begin with the appearance of suppuration, and it is an uncommon event to find them in the pus of a suppurated bubo, unless the suppuration has been very active. Even in a patient approaching convalescence the physiological change caused in the blood by this toxine appears sufficient to produce the death of the bacilli which originated it; and in this way we may have a death from plague due to exhaustion or syncope at a period when the bacilli have undergone complete dissolution; and this alteration in the blood is an argument against the recurrence of the disease in those who have recovered, since it has been demonstrated by experiment that the germ immediately dies, or becomes permanently incapable of culturing itself in the serum obtained from such persons. Or at least it can be reasonably inferred that, unless the epidemic is extensively prolonged, a person once affected and cured can hardly become reinfected, although in every form of infectious fever there are exceptions to the rule. The special pathologists belonging to the various medical missions will, no doubt, deal with the pathological detail of the disease in a more exhaustive and minute manner than my observations permit me to do. There appeared a complete deficiency of tone throughout the whole muscular structure.

In the cavity of the cranium no special morbid appearance was noted. The brain seemed a little softer, and there was a perceptible injection of the medullary vessels or substances. In some instances the nerve-cells under the microscope had appeared slightly atrophied. The covering of the brain had not undergone any change.

On opening the body, the only definite change was congestion of the mucous membranes and their apparent softening, especially of the stomach and small intestines. The heart appeared flabby and soft, the pericardium distended, contained a larger quantity of fluid than usual, and on its inner surface were—but not in all cases—congestive specklings. The orifice of the right ventricle was dilated, as at times were the ventricles also. The stomach was covered with yellowish slimy fluid of a mucoid nature, and so were the intestines, which were in a condition of distension. The liver and spleen were generally engorged and of a dark colour and perhaps enlarged. Microscopically the pancreas presented no unusual aspect, though they might occasionally be increased in size. The kidneys may be enlarged to a variable extent, their surface containing specks of extravasation and the capsules soft and easily torn off. Internally they are usually congested, and there may be hæmorrhage into the pelvis. Indeed, broadly speaking, beyond an engorgement and more or less extravasation of the internal viscera, the pathological changes are entirely confined to direct lesion, whether it be in the gland or lungs.

The gland or glands affected are enlarged and seem as if they have been bruised or contused about their integument. There is a bloody effusion immediately surrounding them. The lymphatic tissue, or cellular membrane, are inflamed. The glands range in size beyond that of a walnut, and are generally livid, and hard unless a tendency to suppuration has set in. Their interior may be engorged and presents points of necrosis. The abdominal and pulmonary glands may also be increased in size, chainlike, and surrounded by hæmorrhagic effusions.

I have already mentioned the appearance of the pneumonic form in a previous part of this paper. It is only necessary to mention that in one of the *post-mortems* the glands at the base and behind the tongue were found

considerably involved, and in another case, where a patient appeared to be progressing favourably, a diarrhoea of mucous discharge setting in, death followed, and it was found that the inflammation from an inguinal bubo, which had extended downwards and inwards, causing an adhesion with the descending colon, suppurated and discharged its contents into the bowels.

Accompaniments met with in the course of post-mortems but unconnected with the disease.

- 1 Patient had renal calculi.
- 1 Phthisis.
- 1 Cancer of the stomach.
- 1 Atrophy of the left kidney.
- 1 Enlarged prostate gland.
- 1 Large polypi in colon.
- 2 Dysenteric ulcerations.

Diagnosis.

This disease can hardly be mistaken for any other form of fever by those who have had any experience in its treatment.

The character of the fever, the staggering gait, the peculiar aspect of, and pain in buboes, and the special nature of the tongue prevent the possibility of its being confused with fever accompanied with any other form of bubo, whether syphilitic or synpathetic. There is also the expression, appearance of the eyes, and the difficulty in articulation or hesitancy in speech to be remembered, and in pneumonia, the character of tongue, sputa, and special physical signs in lungs are distinct from ordinary inflammation.

Prognosis

Is always to be of a guarded nature. The points for a favourable issue are:—When the bubo rises early and advances to rapid suppuration, or when it is firm and moveable; when there is no marked fever, cerebral disturbance, or vomiting; when the respirations do not correspond with the smallness of the pulse; and when there is a moist skin or even a gentle perspiration, with little restlessness and a fall of pulse concomitant with a defervescence of temperature, the pupils regaining their normal size from dilatation, the conjunctivæ not being injected and the tongue being moist.

Summary.

The disease affects those most often between the ages of 20 and 40 years.

It has two forms—chiefly bubonic and pneumonic, the latter being a more fatal and infectious type.

It may have a third form where no enlargement of glands can be detected.

That there is a secondary form of pneumonia originating from hypostasis, which must not be confounded with the primary form, as each has distinct features.

That the pulse does not usually correspond to the temperature nor to the respiration.

* That in all acute cases the bacilli should be present, but in death at a late period, or immediately after recovery, the bacilli may be absent.

It is possible, as an exception to the rule, to contract the disease and exhibit all the symptoms in a mild form by means of bacilli toxine. Without the introduction of bacilli, this might be acquired by direct inhalation of the breath of a plague pneumonia case.

That mild cases of plague may occur from the entrance of enervated microbes in a spent condition or at a period when they are about to proceed towards dissolution.

Being essentially a lymphatic disease, in the first instance originating through an alteration of the lymph in the gland or glands, the continuity of lymphatic tissue in no way, whether going to or from the glands, becomes diseased.

Infection through inoculation, however feasible and correct, leaves room for doubt. The large proportion of cases who were absolutely free from any detectable source of such infection requires further explanation in reference to the glandular type.

That there are no premonitory symptoms such as is found in other infectious fevers is verified from the fact of its setting in with full intensity, but, if incipiently, the condition of the tongue to an experienced observer offers sufficient confirmation of the system having become invaded.

That a person saturated with syphilis even to a mild degree is afforded some protective immunity against a severe attack, and opium also bears the same influence (*vide* my separate report sent in on this subject).

N.B.—Professor Yersin visited the hospital on two separate occasions and declined to use his curative lymph. The many patients present were, in his opinion, unsuitable to his purpose or otherwise too far advanced in the disease.

Treatment

Has to be adopted under the heading of general and local forms.

General.

On the first outbreak of the disease, the pneumonic form appeared to have been overlooked and attention directed to the glandular class only. With this view it was considered necessary to administer antipyretics and to apply antiseptic hypodermic injections deeply into the gland. The reduction of temperature and the destruction of some unknown quality within the gland were apparently the chief objects sought for. This line was followed more on theory than knowledge, from the fact that we did not conceive the phenomena set up after the toxine had access into the blood circulation. The chemical change produced in this fluid and the physiological and pathological results induced on the whole human organism through blood practically poisoned and decomposed by material generated in the course of culture by these bacilli, escaped our observation. There was no literature available to guide us, and we had, as it were, to rely on our own resources and discoveries and trust more to luck than a defined purpose.

On going back to old writings, we find the first intention was to thoroughly clear the *prima via*, and this was done with a smart purgative combined with mercury. Calomel was the drug, but Bulard notes that it was always thrown up or evacuated by the watery motions which it causes. M. Velpeau states, on the known action of this drug on the lymphatic system or glands, that he tried mercurial frictions and blue pill; the effect was such that it remained doubtful whether the medicine or the disease was the worse, and Bulard further asserts that no faith should be placed on this ingredient.

Sir James McGregor, on the other hand, not only eulogizes its therapeutical value as a purgative, but urge its use till some soreness of the mouth was present. He believed it caused the skin to become softer, the pulse more regular, the eye clearer, and the tongue moist, the thirst, head symptoms, and abdominal affection disappearing.

These authors and their contemporaries recommended saline diaphoretics and cooling diluents in order to promote free perspiration, and suggested the liquor ammoniæ acetatis, nitric ether, and camphor mixture, together with cold ablutions. Aided by sudorifics, a sweating arose, which caused an immediate remission from all symptoms.

Blood-letting was practised and condemned, and one, Dr. Whyte, states that he used the lance freely, and in every instance death followed.

Opium, with circumspection, and wine were reputed to be beneficial.

Emetics were recommended and had their supporters on the ground that by unloading the stomach and small intestines they carried a relaxation of the skin and brought on a favourable perspiration.

The Maltese and Egyptian physicians were in favour of the free use of vegetable acids and especially lemon-juice, and also in the form of baths.

Friction with warm oil was supposed to be useful, but Luigi of Pavia, who tried it for 27 years in Smyrna, declares it to be more efficacious as a prophylatic than as a means of cure, and the French surgeons in 1798 and 1799 discarded it as being positively injurious in every way.

Locally.

These same men advised bread-and-water poultices to the buboes, or some digestive or resinous applications instead. The French were in favour of actual cauterization and potassa fusa, and Bulard spoke highly of the artificial formation of buboes by irritating the neighbouring lymphatics.

Clot Bey gave his patients emetics and diffusible stimulants in what he terms the first stage, and bleeding and cupping in the second stage.

Our own local experience unconsciously followed some of the methods adopted in the foregoing. Mercury in the form of liq. hydrarg. perchloride was administered alone, or combined in continual large doses, but without, so far as my observations are concerned, any special benefit. One fact seemed palpable—that is, that plague patients can tolerate an abnormal quantity of this drug without either the production of salivation or the characteristic gum line, or other indications of mercurial manifestations; neither do they exhibit any signs of iodism, under the influence of iodide of potassium, which also failed to do any good. Locally iodine, carbolic acid, guaiacol, alone or mixed, were disappointing when applied to the involved gland, whether on its surface or injected within. And so also were the various plasters of mercury, lead, and belladonna; leeches gave some relief by lessening tension and congestion; and neem leaves, so strongly advocated by natives, completely failed. Indeed, after a fair and extended trial of all these and their local applications, I arrived at the conclusion that the chief object to be attained was to relieve the pain and tension of the bubo and encourage early suppuration by continuous relays of hot linseed poultices, to discard it otherwise as the seat of danger, and regard it merely as a relic of the danger which has originated from within its structure to attack more important functions. Of course

the suppuration of a bubo was a favourable sign in so far that its suppuration did not bring about a cure, since, if a patient live to this point, it is in consequence of other reasons, but it was a more satisfactory ending to the local lesion than a protracted resolution or persistent induration. Its approaching suppuration, however, gave confidence to those attacked, their idea being that the whole mischief was confined to the gland, and with this ending the disease subsided.* It helped them with courage to maintain a cheerful disposition when the acute symptoms had passed and the remainder of the prognosis depended on their physical vitality to resist the debilitating and atonising influence of the disease, or septicæmia.

As regards the effect of medicine, it cannot be stated with satisfaction that we possess any standard remedies of certainty. What might seemingly cure one patient is ineffective in another of the same type, and it is questionable whether the successes shown are not wholly due to scientific nursing and hygienic surroundings of a superior nature and to personal comfort and healthy ventilation. This, of course, was impossible during the "opposition period" of the epidemic, when a large percentage of patients were permitted to remain where they fell ill, in low, dark, overcrowded ill-ventilated rooms, without proper food, or probably no food at all, and absolutely unsupported by the administration of alcoholic stimulants.

The first success was a case at Mandvi. The patient had a bubo in the left inguinal region, a temperature of 105, and all the other characteristics of plague. He was cured in his own house; his friends were well off and provided him with a liberal supply of good milk.

A mixture composed of—

Sodii salici.	grs.	5	} every three hours.
Liq. hydrarg. perch.	...	...	...	...	dr.	$\frac{1}{2}$
Spirit ætheris nit.	...	...	...	...	dr.	$\frac{1}{2}$
Tinct. digitalis...	...	...	...	...	m.	5
Rum	...	...	...	...	oz.	$\frac{1}{2}$
Water	oz.	1 $\frac{1}{2}$	

He had 6 drs. of magnesia sulphur previously, and it operated frequently.

The bubo was painted for the first few days with iodine liniment, and as the skin became sore, constant hot fomentations were substituted. The object of the above prescription was first that the sodii salic. acted as a diaphoretic and antipyretic, digitalis was inserted both as a cardiac tonic and to counteract any depressing effect which the sodii might cause. The nitre was also given to encourage the secretions, and rum for its stimulating qualities. At the end of three weeks the man was quite well. The bubo terminated by resolution and not suppuration. The mercury was added for its alterative and antiseptic qualities or properties under the idea that some poison would be neutralized.

Several other patients treated similarly experienced no benefit and died.

The internal use of permanganate of potash promised favourable results, while guaiacol was applied externally; the end was as above unsatisfactory.

The next change included strychnine owing to the strain of nervous disturbance on the heart, and it has proved a valuable drug, which can be tolerated in comparatively large doses; indeed 5 or 10 minims given every four hours for several days induced no twitchings or tetanic symptoms; it was therefore added to the first mixture. At this stage carbolic acid was introduced. Some preferred it in the form of sulpho-carbolates, but I used the acid instead. Its *modus operandi*

is still obscure. Its antizymotic action is well known, especially in preventing fermentation, and it has the power of arresting molecular processes detrimental during the hyperpyrexial state. It is an antipyretic capable of considerably reducing the temperature, and, though accused of disturbing the cardiac centre under ordinary circumstances, it does not appear to do so in plague. Indeed phenol is a natural product resulting from the pancreatic ferment on proteids, and as tympanitis is a common accompaniment in this disease from fermentation, we are only adding an excess of an item which nature has already provided in our natural state. It may be pushed in 2 or 3 minim doses every three hours and beyond a point where it not only discolors the urine greenish, but causes retention. It is the most reliable drug at our disposal.

Iodine is another valuable medicine which has found favor in the treatment of plague; it is a diffusible antiseptic, exerting especial efforts on the glandular or lymphatic system and is best administered in the form tincture. Even in 5 minim doses, continued every three or four hours for a week, it did not act apparently in breaking down red corpuscles and causing a bloody condition of the urine. It may therefore be summed up that the bulk of my cases were treated as follows for the glandular variety:—

Liq. strych.	m. 3	} every three hours.
Carbolic acid	...	...	m. 2
Tinct. Iodine	...	...	m. 4
Tinct. Digitalis	...	...	m. 5
Aqua	...	...	oz. 1

Hot poultices to bubo. 1 oz. of rum every three hours; about 2 pints of milk during the 24 hours, and in every case where the temperature exceeded 103 an ice-bag was applied to the head.

At bed-time $\frac{1}{2}$ dr. to 1 dr. of the liq. morph. hyd. B. P. was given and repeated once if necessary. When a patient was incapable of swallowing from any reason, everything was administered per rectum.

Pneumonia—

Liq. strych.	m. 3	} every three hours
Sodii salici	...	...	gr. 5
Carbolic acid	...	...	m. 2
Tinct. digitalis	...	...	m. 4
Spt. ætheris	...	...	m. 10
Tinc. scillæ	...	...	dr. $\frac{1}{2}$
Aqua	oz. 1	

The whole of the thorax to be kept enveloped in hot linseed poultices. Stimulants, food, &c., as in the other type. There was no use in trying speculative treatment after these two prescriptions showing the best results.

Tympanitis was relieved by hot turpentine stupes or hot linseed poultices over the whole abdomen, and where constipation was present with tympanitis, an enema of turpentine, with 15 or 20 oz. of hot water, saturated with $\frac{1}{2}$ dr. of tincture of iodine, afforded relief. A slight variation had occasionally to be made where unforeseen symptoms appeared. A persistent hicough was best stopped with a dose of laudanum and the application of a piece of ice on the pit of the stomach.

The atonic diarrhoea which takes place occasionally originates during convalescence, occupies the lower bowel, and is yielding to enemata composed of—

Dover's powder.....	gr. 5	} every 3 hours or often.
Bismuth	gr. 5	
Rice water, warm	oz. 2	

Or to a draught of—

Dilute sulphuric acid	dr. $\frac{1}{2}$	} every 2 hours.
Water	oz. 1	

as a draught according to circumstances proves satisfactory.

Where there was delirium or sleeplessness, hyosine hypodermically in $\frac{1}{16}$ th or $\frac{1}{8}$ th grain proved disappointing. Sulphonal is fairly beneficial.

Bromide of potassium and chloral hydr. were satisfactory in less acute cases or in sleeplessness without delirium.

Opium is well tolerated, but morphia proved the best narcotic in my hands.

Phenacetin, antipyrin, and other pyretics of this group are too depressing and unsuitable.

Any idiosyncrasy with respect to digitalis may be relieved by substituting strophanthus. Camphor is unreliable. So is Salol.

Alcohol is borne in large quantities even where patients have been conscious. 12 ounces of Jamaica rum given within 24 hours produced no intoxication.

Continued hypodermic injections of æther over the cardiac region for heart failure failed; this I attribute to the failure being due to toxic paralysis, and not to temporary or functional fatigue or syncope.

The compound cinnamon mixture so strongly advocated by some medical men was given a fair trial with no benefit.

In an early case where there was an abrasion on the hand with an axillary bubo, the Russian Medical Commission pronounced the attack to be due to inoculation. With this idea they suggested the arm being rolled up from fingers to neck with lint soaked in a 1-1000 solution of perchloride of mercury and covered with waterproof sheeting; the lint to be moistened every third hour. This was continued for three days. The patient got worse; the treatment was abandoned and carbolic acid and iodine mixture substituted. She ultimately recovered. The theory was to overtake the disease in its lymphatic stage by causing local absorption of the corrosive sublimate and destroying the bacilli or toxine.

Nitrate of pilocarpine acted as a powerful and rapid diaphoretic, but otherwise failed. It was given in $\frac{1}{10}$ gr. doses hypodermically.

The ipecac. treatment recommended by some medical missionaries in China produced continual emesis, but did naught else.

Wet packing and immersion in ice contributed towards the reduction of temperature, but each patient on whom it was practised died. The reduction was only temporary.

Thirst was relieved by *ad lib.* quantities of soda (not aerated) water and lemonade, also by acid fruits, such as oranges and limes, which were much appreciated.

Regular feeding both day and night, and otherwise careful nursing with comfortable bedding and a change of clothing daily, are essential considerations.

Disinfection.

This consisting in adding perchloride sol. 1-1000 to every excretion, whether evacuations, urine, vomited matter, or suppurated discharges, and as far as possible to pulmonary expectoration.

1-1000 sol. of perchloride of mercury and a 5 per cent. solution of carbolic acid was ever ready in the wards to wash the hands, sponges, or instruments used in connection with the cases.

Rags or linen squares used as dressings or to wipe up excretions and sputa, being of no value, were burnt.

Bedding, as sheets, blankets, pillow slips, &c., and clothing were, on being changed, saturated with a one per cent. solution of perchloride of mercury then exposed in the sun till dry and subsequently washed in the ordinary way by a resident dhoby.

The general latrines for native employes and convalescents were treated twice a day with carbolic powder. The evacuations received in an iron vessel with deep sides to prevent splash were disinfected with a 1-1000 corrosive solution and every night conveyed to a special nightsoil cart for disposal.

Hospital.

Consisted of three wards, each about 66×33 ft. capable of holding 78 patients, and on several occasions had nearly their full complement. Originally the wards were sheds with a good plinth and tiled roof, intended and used for other infectious diseases; the walls consisted of matting with a foot opening below and above, which afforded ample and free ventilation; the flooring was of earth beaten down and laid with a layer of lime, and the lime renewed every month. Expert medical opinion declared the flooring to be proof against the life of plague bacilli.

A stand-pipe was provided in front for hospital use, and one behind for the halalcores and dhoby. The surplus water was conveyed into the immediate drain on the western side.

Segregation huts were erected on the weather side for patients' friends, of whom a large number availed themselves of this convenience. They were in all instances supplied with food, if they desired it, or provided with money from the Pollen Fund, instead, for this purpose.

All persons who died were removed to the mortuary and, pending removal to the cemetery, were sprinkled over with carbolic powder. On removal, their bodies were washed with a solution of phenyle and afterwards rolled in a sheet saturated in a solution of perchloride of mercury.

Where friends provided their own burial arrangements for the dead and dressed the body in new clothing, the disinfecting sheet was not omitted.

Where friends desired a private burial for their dead and had no means to carry out their intentions, money was given them from the Pollen Fund, or they were assisted with money and new clothing from the Hospital stock.

Caste sympathies and prejudices were always respected, and after the people found this out and the liberty and freedom allowed between friends and patients, it created full confidence in every direction.

The outdoor dispensary gave relief to 75 patients suffering from various ailments. Two reasons interfered with more work being done here: first, the staff were fully occupied in their primary duties, and, secondly, the native public appeared doubtful as to the object of the dispensary. They suspected its institution as a sort of inducement to have their ailments discovered, which might wrongly be mistaken for plague. But latterly this suspicion was dying out, and an outdoor dispensary in the same locality is capable of doing a vast amount of good. It is central and in the midst of a large poor population.

The staff of the Hospital, whose duties were carried on actively both day and night, consisted of—

1 Medical Officer.	2 Brahmin Cooks.
2 Hospital Assistants.	1 Mahomedan Cook.
1 Compounder.	10 Men belonging to the 17th Bo. N. I. were trained as ward orderlies. They performed their duties most satisfactorily and evinced thorough obedience and discipline to all orders.
7 Nurses from the Roman Catholic Convents.	10 Men belonging to 21st Bo. N. I. were also trained as ward orderlies.
10 Ward-boys.	
1 Storekeeper.	
1 Office peon and dispensary servant.	
9 Sweepers.	

Seeing that all the working staff was new to this class of work, which required incessant care and watchfulness, it is gratifying to note that all the employees conducted their duties to my entire satisfaction, and Hospital Assistants Prabakar Bulwant and Sayaji Sowaji (the latter subsequently transferred to Cutch Mandvi) rendered excellent service.

I cannot write too highly on the devoted and self-sacrificing manner in which the Sisters of the Roman Catholic Convents performed their arduous work under the supervision of the Reverend Mother St. Agnes. Having closed their class rooms purposely to accept this duty of nursing and never having been engaged in a similar capacity before, their attention and anxiety for the sick deserve great praise.

On the 14th of June these ladies were replaced by Miss Morey, Miss Hale, and later on by Miss Kendall, Mrs. McGill from the J. J. Hospital, and Miss Anderson. The Nurses from England exhibited great aptitude and intelligence, both medical and surgical, in the discharge of their official functions and are a credit to the Hospitals where they received their professional education. Mrs. McGill is a painstaking and careful Nurse, on whom every reliance can be placed, while Miss Anderson is a capable woman in all details and in this respect gave every satisfaction.

TABLE A.—Classification of Plague cases in Grant Road Hospital.

Description.	No. of cases.	Recovered.	Died.	Description.	No. of cases.	Recovered.	Died.	Description.	No. of cases.	Recovered.	Died.	Description.	No. of cases.	Recovered.	Died.
Pneumonia	98	36	72	Bubo, right and left parotid and right axillary glands ...	1	1	...	Bubo, left axillary glands ...	18	10	8	Bubo, right cervical and right inguinal glands ...	1	1	...
Pneumonia with bubo in left parotid gland ...	1	...	1	Bubo, right parotid and right axillary glands ...	1	1	...	Bubo, right and left axillary glands ...	2	2	...	Bubo, left supra trochlear and left inguinal glands ...	1	1	...
Pneumonia with buboes in left parotid, and right and left inguinal glands ...	1	...	1	Bubo, right parotid and left axillary glands ...	2	...	2	Bubo, right axillary and right supra trochlear glands ...	2	1	1	Bubo, right femoral glands ...	11	4	7
Pneumonia with bubo in right axillary glands ...	8	5	3	Bubo, left parotid and right axillary glands ...	1	...	1	Bubo, left axillary and left supra trochlear glands ...	1	1	...	Bubo, left femoral glands ...	13	3	10
Pneumonia with bubo in left axillary glands ...	3	...	3	Bubo, left parotid and left axillary glands ...	1	...	1	Bubo, right axillary and right inguinal glands ...	1	...	1	Carbuncle, left inguinal glands	2	2	...
Pneumonia with bubo in right inguinal glands ...	11	6	5	Bubo, right parotid and right cervical glands ...	1	1	...	Bubo, left axillary and left inguinal glands ...	1	1	...	Without bubo or pneumonic indications ...	2	2	...
Pneumonia with bubo in left inguinal glands ...	5	3	2	Bubo, left parotid and left cervical glands ...	1	...	1	Bubo, left mammary glands ...	1	...	1		2	2	...
Pneumonia with buboes in right and left inguinal glands ...	2	2	...	Bubo, left parotid and sub-inguinal glands ...	1	...	1	Bubo, right lumbar and left popliteal glands ...	1	1	...		...	...	...
Pneumonia with bubo in right femoral glands ...	2	1	1	Bubo, right parotid and right femoral glands ...	1	...	1	Bubo, left inguinal and left popliteal glands ...	1	...	1		...	...	...
Pneumonia with bubo in left femoral glands ...	1	...	1	Bubo, right and left parotid and left inguinal glands ...	1	...	1	Bubo, right inguinal glands ...	66	28	37		...	...	...
Bubo in right parotid glands ...	10	5	5	Bubo, left parotid and left inguinal glands ...	1	...	1	Bubo, left inguinal glands ...	60	28	32		...	...	...
Bubo in left parotid glands ...	3	3	5	Bubo, right axillary glands ...	24	9	15		4	1	...		...	...	...
<div> <div>Total number of cases</div> <div>" " deaths</div> <div>" " recoveries</div> <div>Mortality</div> <div>Recoveries</div> <div>Deaths under 24 hours</div> <div>Mortality excluding deaths under 24 hours</div> <div>Recoveries " " "</div> </div>															
<div> <div>574</div> <div>225</div> <div>149</div> <div>60.16</div> <div>39.84</div> <div>84.5</div> <div>48.65</div> <div>51.35</div> </div>															

TABLE B.—Persons attacked according to Castes in Grant Road Hospital.

Details.	Brahmins. 1	Kamatoos. 2	Marathas. 3	Rajputs. 4	Purdhrees. 5	Surtees. 6	And all other Hindus. 7	Mahomedans. 8	Goonese. 9	Native Christians 10
Attacks ...	4	3	156	1	23	4	102	61	11	12
Deaths ...	1	2	98	...	13	4	60	32	7	8
Recoveries.	3	1	55	1	10	...	42	29	4	4

Total number of Hindus of all sections—Attacked 290, Mortality 68·27.

“ “ Mahomedans “ “ 61, “ 52·62.

“ “ Goonese “ “ 11, “ 63·63.

“ “ Native Christians “ “ 12, “ 66·66.

N.B.—Column 7 includes all Hindus not differentiated on admission, but chiefly refers to low caste.

TABLE C.—Occupation of those attacked in Grant Road Hospital.

Occupation.	No.	Occupation.	No.
Labourers ...	110	Brought forward ...	329
<i>Nil</i> ...	54	Hawkers ...	3
Mill-hands ...	40	Malis ...	3
Domestic servants ...	22	Bill collectors ...	3
Mendicants ...	16	Dhobies ...	3
Shoe-makers and workers in leather ...	13	Money-lenders ...	3
Cooks... ..	9	Ramosis ...	2
Peons... ..	8	Ayaks ...	2
Sweepers ...	7	Bakers ...	2
Cart-drivers ...	7	Clerks ...	2
Barbers ...	6	Fitter ...	1
Shopkeepers ...	6	Tanner ...	1
Confectioners ...	5	Dancing girl ...	1
Tailors ...	5	Policeman ...	1
Weavers ...	5	Horse trainer ...	1
Tobaccoonists ...	5	Milkman ...	1
Goldsmiths ...	4	Oil seller ...	1
Carpenters ...	4	Coachman ...	1
Blacksmiths ...	4	Syces ...	1
Fisher folk ...	3	Ward orderly ...	1
Municipal lime-washers ...	3	Corker ...	1
Khalasis ...	3	Stoker ...	1
Carried over ...	329	Total cases ...	374

N.B.—*Nil* includes dependents, school and other children, unknown, and married without occupation.

TABLE D.—Persons attacked, according to Age, in Grant Road Hospital.

Age between.	ATTACKS.			RECOVERIES.			MORTALITY.		
	Males.	Females.	Total.	Males.	Females.	Total.	* Males.	Females.	Total.
5	7	4	11	2	1	3	71·44	75	72·7
10	11	4	15	6	1	7	45·46	75	53·4
15	13	5	18	6	2	8	53·85	60	46·7
20	33	14	47	18	8	26	45·46	42·9	44·7
25	50	17	67	27	4	31	46	70·5	53·7
30	62	27	89	24	6	30	61·2	77·8	67·3
35	28	21	49	8	9	17	71·43	57·1	65·3
40	22	6	28	6	4	10	72·73	33·4	64·29
45	7	5	12	1	3	4	85·72	40	66·67
50	12	6	18	3	2	5	75	66·7	72·23
55	5	3	8	2	1	3	60	33·4	62·52
60	9	3	12	5	...	5	44·5	100	58·34
65	...	...	...	...	...	...	...	...	...
70	1	1	2	...	...	...	100	100	100

TABLE E.—Persons attacked, according to Sex, in Grant Road Hospital.

CASES.			RECOVERIES.			MORTALITY.		
Males.	Females.	Total.	Males.	Females.	Total.	Males.*	Females.	Total.
260	114	374	108	41	149	58·47	64·04	60·16

Report of Dariastan Lohana Hospital.

PRIVATE HOSPITAL No. 1.

This hospital opened on 1st April 1897 under the late Dr. Dnoda (deceased 1st May 1897). Expenses provided by Sheth K. Damji till closure.

Hospital Staff.

1 Medical Officer (<i>deceased of plague</i>).	8 Nurses.
1 Compounder.	3 Ward-boys.
	11 Servants.

Hospital Board.

Sheth K. Damji.	Mr. Gopal Ramji.
Mr. S. Pragji (Secy. and Treasurer).	„ K. Kalianji.
„ Liladhur Kaya.	„ Kalianji Chagpal.

Cases	79	} Of these, the general symptoms and treatment are as follows :—
Discharged ...	24	
Convalescent ...	5	
Deaths ...	50	

Symptoms—

Bubo in the groin much more frequent than axillary.

When bubo is *absent*—

1. High fever (102—107·2)
2. Pain in back and groins.
3. Injection of eyes.
4. Furred tongue.
5. Constipation.
6. Great and uncontrollable restlessness.

Bubo *present*—

1. Majority in groin.
2. Lower temperature.
3. Prognosis favorable.

Treatment—

(a) General—

1. Stimulants.
2. Fomentation.
3. Mercurial plaster in cases of subsidence of glands.
4. In cases of suppuration, incision and dressing daily.

(b) On admission—

1. If sensible, *senna*.
2. If insensible, *enema and castor oil*.
3. Ammon. carb. with ammon. brom., or as symptoms demand.

Diet (general)—

Milk until subsidence of temperature.

Disinfecting operations—

1. Phenyle lotion to floor.
2. Mercury solution to hands of attendants and visitors.
3. Burning of patients' clothes on admission.

NOTE.—*Abortion*—Fatal to women cases.

Report of Sahebs' Servants' Hospital.

PRIVATE HOSPITAL No. 2.

This hospital, established by the exertions of Professor O. V. Müller and others at the outbreak of the panic and exodus of natives, was opened on 26th January 1897 for the servants of all firms, banks, hotels, clubs, and private individuals, and was closed on 1st May 1897.

Hospital Board.

Brig.-Surg.-Lieut.-Col. Barker, I.M.S.	Mr. A. E. Ferguson, (Hon. Secretary, Bombay Club).
The Hon. Mr. Abercrombie.	
Mr. E. Slater.	„ C. Boileau, (Hon. Secy., Yacht Club).
„ J. W. Moir.	Prof. O. V. Müller (Hon. Secy. and Treasurer).
„ R. A. Willis.	

Hospital Staff.

Medical Officer, Mr. M'Cabe Dallas.	Nurses, Gibson & Brown (in succession).
Hospital Assistant, Mr. Framjee.	1 Brahmin Cook.
Hospital Attendant, Mr. Gopal.	2 Sweepers.
Nurse, Nesbitt.	2 Water Women.

Professor Müller also undertook the general supervision of the hospital. The contributions and subscriptions amounted to Rs. 5,229.

Cases 86	} Of the 86 patients admitted, 62 died. The following are the details :—
Recovered ... 24	
Died 62	

Admitted.	Moribund.	Recovered.	Died.	Death-rate.
86	24	24	62	72

If those admitted moribund and dying within 24 hours be excluded as beyond treatment, the death-rate falls to 61. The proportion of males to females is 74 to 12, as in the case of *this* hospital is to be expected. The high mortality is partly due to the number of moribund cases admitted. Of the pneumonic cases that were frequent in January and February, all proved fatal.

It has been found impossible to include in a collection of hospital records, for the most part purely statistical, several incidents of considerable general interest in connection with the establishment and the working of this hospital at an extremely critical moment in the fortunes of employers and servants alike. But the report makes it sufficiently plain that the scheme was well conceived and energetically carried out by its designers.

Dr. Dallas' Report on Dr. Yersin's Inoculations in Sahebs' Servants' Hospital.

Dr. Yersin operated on four cases in the Sahebs' Servants' Hospital, and the following is a recapitulation of Dr. Dallas' remarks in the *Bombay Gazette* of March 27th :—

(I.)—DADU GUNGADDEEN.—		Registered date of attack...	March 9.
	Inoculated	... ..	March 11, 12, 13.
	Died	... ..	March 17.
(II.)—HAITAN.—		Registered date of attack...	March 10.
	Inoculated	... ..	March 12, 13, 14.
	Died	... ..	March 17.
(III.)—BHUGWAN.—		Registered date of attack...	March 13.
	Inoculated	... ..	March 14, 15.
	Died	... ..	March 16.
(IV.)—AMEEN.—		Registered date of attack...	March 11.
	Inoculated	... ..	March 12, 13, 14, 15.
	Remains under observation. March 27.		

The registered dates of attack in these four cases can be relied on as practically correct, so that they were approximately new cases. Thus

On Admission—

- No. 1 showed signs of pneumonia.
- No. 2 had inguinal bubo.
- No. 3 had yet undeveloped bubo.
- No. 4 was entirely free from complication.

No. 4.—With No. 4 however, about four hours after the second inoculation the lower left axillary gland became enlarged. The state of the patient on admission can be verified by one of the gentlemen belonging to the German Medical Commission. My own opinion at the time, although she had received one inoculation previous to her arrival at hospital, was that it presented more than doubtful symptoms of plague. It is possible that the appearance of the bubo mentioned might have originated traumatically—*i.e.*, sympathetically in sequence to the inoculative operation. Mr. Hankin has examined her *sputa* and failed to detect microbes. This negative result is not confirmatory of her not having plague. Her blood is being cultured also.

For the moment, however, this case may be passed over, since from the date of her last inoculation (15th ultimo) she has been placed under hospital treatment for remittent fever. (No bacilli were found in the blood or urine.)

No. 2.—In case No. 2, the day after the last inoculation, *i.e.*, the day before his death, both parotid glands became enlarged suddenly, causing constriction, which intensified his symptoms.

Generally speaking-

(a). The peculiarities connected with the inoculations in these few cases represented intense discomfort in the locality receiving the *serum*. The quantity apparently necessary for injection is very large. It can easily be conceived, then, that the forcible introduction of fluid at several points must cause rupture of the muscular fibres and create pain. And where two of the patients were conscious they dreaded a repetition of the process.

(b). In case No. 2 a violent intoxicating condition set in two hours after each inoculation, with incessant thirst.

Case No. 1 also exhibited this state, his intoxication impelling him to tear the bed-clothes.

(c). Though there was a slight apparent fall in the temperature after inoculation, it was only temporary.

(d). The falling asleep of the patient—a characteristic benefit which, I believe, Dr. Yersin relies on—was entirely absent in each case. Indeed, resort had to be had to morphia to induce sleep.

(e). The death of three of these patients and the doubtful condition of the fourth are not very encouraging, especially considering the brilliant statistics brought by Dr. Yersin from China.

It is true that four is too small a number of experiments on which to pronounce any definite opinion against the usefulness of Dr. Yersin's treatment. Still it is unfortunate that with such choice of selection such fatal results occurred. There is a certain danger of this creating a want of confidence in the method, especially when it was anticipated from report that failure was to prove the exception. It has, moreover, to be borne in mind that it is only among the well-to-do that we can look for early intimation of attacks.

Thus, if this remedy is to be restricted to that class alone, the bulk of the population will never enjoy the benefit of it. Their prejudice will prompt their natural disposition to conceal their sick, and the chances of these, when discovered, proving curable subjects will be extremely remote.

Report of the Bhatia Plague Hospital.

PRIVATE HOSPITAL No. 3.

This hospital was opened on 18th March 1897. This hospital received 33 cases, of which 25 died; a *mortality of 78 per cent.*

Cases.

Recoveries.

Convalescents.

Deaths.

} Of which no details are presented.
j

Hospital Board.

G. T. Mooljee, Esq., J.P.	} Secs. and Treas.	R. Surji, Esq.
M. Sh. Lache, Esq.		P. N. Moolji, Esq.
L. N. Lundeschi, Esq.	} Hospl. Managers.	K. Mulji, Esq.
N. Ramji, Esq.		Murari Nonsi, Esq.
M. Virchi, Esq., Solicitor.		H. B. Bania, Esq.
R. Haridas, Esq.		Canji Soonderji, Esq.

Hospital Staff.

Dr. Purshotam Harischand, L.M.& S.	Two Compounders.
Dr. Vaidya Manishanker Vithalji.	Store Clerk.
Mr. P. Jetha, Hospital Assistant.	Storekeeper.
Mr. V. P. Kammashanka, Hos. Asst.	

Report of Cutchi Memon Plague Hospital.

PRIVATE HOSPITAL No. 4.

HOSPITAL BOARD.

Haji J. H. A. Patel, J.P., *Chairman.*

Haji S. Abdul Wahed, J.P.	} Secretaries and Treasurers.
Haji T. H. Esmail, J. P.	

Members.

Haji Mahomed H. Esmail, J.P.	Haji Mahomed Abba.
„ Abdul S. Oomer, J.P.	„ Peer Mahomed Allarakhia.
„ Esmail Allana.	„ H. S. Siddik.
„ A. L. H. A. Pakhar.	

Medical Staff.

Dr. V. K. Parulkar, Chief Medical Officer.	Nurse Fravill.
„ D. M. de Silva, Hony. Physician.	„ Moore.
„ Pechey Phipson, Lady Doctor.	Hospital Assistant Mahadeo J. Gore.

This hospital opened 29th March 1897, closed 30th May 1897. Admitted 19 patients, of which eight died, four within 24 hours, having been brought in a moribund state to hospital.

Cases	19	} Of this number the following are the details :—
Recovered	...	...	11
Died	...	...	8

Sex.	Died.	Mortality.
Male 12	Male 5	78.48
Female 7	Female 3	

Report of Clive Road Hospital.

PRIVATE HOSPITAL No. 5.

This hospital opened on 17th March 1897, and is not to be closed before 31st July 1897. It has admitted in all 47 plague patients, of whom 30 died.

Established by Mr. Vassanji for the benefit of the Dassa Osval Bania caste, it has been supported entirely at his expense.

Hospital Staff.

Dr. Manchershah N. Disana, L.M. & S.	2 Cooks.
Mr. Dulabhram Purshotam.	1 Peon.
„ A. E. Roberts, Compounder.	1 Sweeper.
„ Asaria Ponsey, Manager and Storekeeper.	10 Ward-boys.
„ Liladhar Kalidas, Clerk.	

No European nurses were employed, nor is there any hospital board.

Cases	...	...	...	...	47
Recoveries	...	...	...	...	17
Deaths	...	...	...	...	30

Report of Memon Mohalla Plague Hospital for Halai Memons.

PRIVATE HOSPITAL No. 6.

This hospital opened on 18th April 1897 under Dr. Ruston R. Ranina, Honorary Physician. Received no cases.

Hospital Board.

Haji O. Chotanee (deceased).
Mr. D. Rhamtoola.
Haji Omer Jamal.

Medicines provided by Hospital Board.

Staff.

- 1 Native Hakim.
- 1 Nurse.
- 2 Ward-boys (engaged) at Rs. 10 per mensem.

Report of Kolsa Moholla Memon Mahomedan Hospital.

PRIVATE HOSPITAL No. 7.

Established 1st April 1897. Received three patients only, one of these from Damaun and one from Bassein. These two were admitted moribund and died.

Hospital Board.

- | | |
|--|--------------------------|
| 1. P. Haji Ebrahim H. Sooman. | 5. Haji Joostuf Ebrahim. |
| 2. Haji Ebrahim Ahmad. | 6. Haji Soomar Kassum. |
| 3. Sirdar Khan Bahadur H. Kassum
Mitha. | 7. N. Haji Valimamad. |
| 4. Mr. Alimamad Aba Jooma. | 8. Haji Oosman H. Aba. |

Medical Staff.

Dr. Disana, L.M. & S. | Storekeeper.
Dispenser. | Nurse.
Manager.

Imambara for Moguls.

PRIVATE HOSPITAL No. 8.

No report was received from this Hospital.

Report of Tantanpura Street Hospital.

PRIVATE HOSPITAL No. 9.

This hospital opened on 28th March 1897, and temporarily closed after 15th May 1897. Admitted 30 patients.

Medical Staff.

Dr. J. B. deQuadros.	|	1 Apothecary.
„ D. M. deSilva.		

Hospital Bombay.

Mr. Ahmedbhoj Habbibbhoj,	|	Mr. Fazalbhoy M. Dhama.
President.		„ K. M. Jheta.
„ H. Cassumbhoj.		„ Ibrahim Alladin.
„ Jajumbhoj Dato.		„ J. M. Dhama.

Cases	...	30	} There were 8 males, 13 females, and 9 children.
Recoveries	...	13	
Deaths	...	17	

General Symptoms.—

1. Non-malignant and glandular.
2. Pneumonic or cerebral types.

Site of Bubo—

Cervical	...	...	7
Inguinal	...	...	20
Axillary	...	...	8

Period of greatest virulence—March and April. Out of the 11 patients inoculated by Dr. Yersin only two survived.

Report of Marjadi Vaishnar Bania Hospital.

PRIVATE HOSPITAL No. 10.

This hospital, established primarily for Majardi Vaishnar patients and Banias of any high caste, was opened on May 1st by agreement between the Dasa Sorathia Bania and Visa Nagar communities; but when ready the hospital was declared open to all high caste Hindus. It is to be closed on July 1st, but will be re-opened on any fresh outbreak of the plague.

Hospital Board.

- | | | |
|---------------------------|--|----------------------------|
| 1. Mr. Kababhai Virchand. | \| | 3. Mr. Nagindas Dwarkadas. |
| 2. „ Motilal Kanji. | | 4. „ Gulabdas Gungarao. |

Medical Officer and Staff.

Dr. H. Merchant.

1 Native Medical Officer.	2 Ward boys.
1 Native Vaid.	1 Hamal.
1 Hospital Assistant.	1 Cook and Storekeeper.

Statistics.

Cases ... 7	} Of the seven patients admitted, two only belonged to the caste. With the exception of one, all were mild cases. One was discharged convalescent.
Discharged ... 4	
Remaining ... 1	
Died ... 2	

One was under ten years of age.	} Of these, five were imported and two were patients from the city.
One " twenty "	
Three " forty "	
Two above forty "	

Report of Marwari and Fattepūria Fever Hospital.

PRIVATE HOSPITAL No. 11.

Opened 1st April 1897.

Managing Committee.

Seth Govindass Lachmandas.	Seth Shewlal Moteelal.
" Tarachund Ghunushamdass.	" Heeralal Ramgopal.
Rai Bahadur Bhagwandass Bagla	" Thakerseydass Baldewdass.
(Director).	" Khetseydass Hurnundral.

Medical Staff.

Dr. A. D. Mody, L.M. & S., J.P.
 Mr. Luxmon Vinayeck, Asst. Medical Officer.
 Mr. Choonilal, Asst. Overseer.

Hospital Staff.

Ward-boys... .. 2	Sweepers... .. 2
Brahmin cook ... 1	Gate-keepers ... 2

*Extracts from Case Book and Hospital Register forwarded by Dr. Mody
 with Notes on their General Treatment.*

Cases 8
Discharged 2
Removed 1
Died 5

Cause of Death—

Failure of heart's action ... 4
Failure of respiration ... 1

General Treatment—

1. Application of cold to the head.
2. Fever and stimulant mixture.
3. Liq. Hyd. Bichlor. in some cases.

Symptoms—

- | | | |
|------|----|---|
| Case | 1. | Left femoral glands enlarged. |
| " | 2. | Bubo in right axilla—absorbed by treatment. |
| " | 3. | Left axillary glands affected. |

Report of Chattri Sarang Hospital.

PRIVATE HOSPITAL No. 12.

This hospital was opened on 25th March 1897.

Medical Officers.

Dr. N. B. Lam (successively).	|	Dr. H. G. Mohidin.
Dr. A. L. Kazi ( " )	|	Mr. Mirza Khalil, Secretary.

Report of Nizampura Street Fever Hospital.

PRIVATE HOSPITAL No. 13.

This hospital was established on 25th March 1897 and closed on 2nd June 1897, and received 22 patients, of whom 9 died.

Hospital Founders.

Mr. Haji Shamsuddin Markay.
 Mr. Mulla Mahomed Azeem (Agent to Ameer of Cabul).
 Mr. Mahomed Ali Toongaker.
 Mr. Moulvie Hidayatullah, J.P.

Medical Officers.

Dr. Dawda,
 Moonshi Mir Kasam Ali (5th May).

Cases	22	} Of the 22 cases admitted, 13 were from five streets, viz., Kazi, Goghari, Nizampura, Tookri Moholla, and Bapu Khoti.
Recovered ...	...	13
Died ...	...	9

The following are details (most of them having received *Uzani* medicine gratis).

The period of detention in hospital of those discharged was remarkably short, thus:—

Admitted.		Discharged.	
1.	28th March 1897	...	6th April 1897.
2.	7th April 1897	...	14th "
3.	9th "	...	16th "
4.	20th "	...	20th May 1897.
5.	28th "	...	3rd "
6.	30th "	...	5th "
7.	3rd May 1897	...	10th "
8.	10th "	...	17th "
9.	26th "	...	28th "
10.	6th June 1897	...	14th June 1897.

With the exception of one case which remained a month in hospital, no case exceeded *one week*, which is extremely unusual, and does not necessarily point to exceptionally skilful treatment.

Similarly with deaths, however, in a more remarkable degree, thus:—

Admitted.		Died.	
1.	2nd April 1897	4th April 1897.	
2.	4th "	5th "	
3.	12th "	12th "	
4.	15th "	16th "	
5.	16th "	18th "	
6.	4th May 1897	5th May 1897.	
7.	5th "	8th "	
8.	10th "	11th "	
9.	26th "	28th "	

These 9 patients only spent 13 days in all in hospital, or about 36 hours each. The statistics are too doubtful to be embodied in the general report, though there is ample evidence to show that the hospital did excellent work for the purpose for which it was called into existence. The Committee regret to record that Dr. Dawda died of plague—a victim to his devotion to duty, in the performance of which they found him zealous and diligent.

Report of Khatri Memon Mahomedan Hospital.

PRIVATE HOSPITAL No. 14.

This hospital—opened on 1st April 1897 and provisionally closed 15th June 1897—received two plague cases only. Of these, no details were given.

Hospital Board.

Haji E. H. Oosman.	Haji O. Suleman.
" E. Essu.	" S. Dadu (Secretary).

Medical Officer.

Dr. M. N. Disana, L. M. & S.

Staff.

1 Compounder.	2 Ayahs.
1 Storekeeper.	1 Peon.
4 Ward-boys.	1 Sweeper.

General Report of Falkland Road Hospital.

PRIVATE HOSPITAL No. 15.

This hospital was opened on 7th May 1897, and closed on 28th May 1897. Received four cases, which were all discharged cured.

Medical Staff.

Surg.-Maj. Deane, D. M. O.	Sirdar Omar Jamal (Secretary).
Dr. Dodhalkar.	

Hospital Staff.

1 Ayah.	1 Hamal.
2 Ward boys.	1 Compounder.
1 Cook.	1 Bhungi.

Cases ... 4 } The following are details :—
Discharged ... 4 }

Case 1. Bubo and fever.

Cases 2 & 3. Pneumonia.

Case 4. Woman *encointe*, no plague.

Charni Road—Ward for Bhangsalis.

PRIVATE HOSPITAL No. 16.

No report was received from this Hospital.

Report of Adamji Peerbhoy Hospital.

PRIVATE HOSPITAL No. 17.

This hospital opened on 10th March 1897, and was equipped at the sole expense of Mr. Adamji Peerbhoy for the use of the Borah community.

Hospital Board.

Adamji Peerbhoy, Esq., J.P. (President).

Mahomedali Adamji, Esq., J.P.

Abdul H. A. Peerbhoy, Esq., J.P. (Secretary).

Hakim M. Dayan, Esq., J.P.

Medical Staff.

Dr. E. Abdul Hussein (in charge).

Mrs. Beale (Female ward).

Nurse Johnson.

Hakim M. Dayan.

Hakim M. A. Misri.

Hospital Assistant D. W. Patel.

Treatment on admission (after diagnosis).

1. Bath (burning of old clothes and supply of new, free of expense).
2. Segregation of attendant relatives and free support in ward by Mr. Peerbhoy during patient's stay.
3. Free choice of medical treatment.
4. Brisk purgative (*Majun-Shifa*, a native drug, administered).
5. Febrifuge and cordial medicines.
6. Application of ice-bag to the head with vinegar and rose.
7. Pus-inducing application to glands and *Marhame Ahmas*.

	Sex.	Age.	Occupation.	Admission.	Symptoms.	Type.	Issue.
1	M	50	.....	8-19-97	Left groin	Convalescent	Cured.
2	M	18	Tinman	8-19-97	Fem. Leg.	Digestive	Death.
3	M	30	Broker	8-19-97	Neck	Pneumonic	"
4	M	25	Trader	8-20-97	Groin	Nervous	"
5	F	65	.....	8-20-97	Fem. Leg.	Pneumonic	"
6	M	22	Trader	8-20-97	Right groin	Digestive	Cured.
7	M	15	Tinman	8-20-97	.....	Pneumonic	"
8	M	50	Trader	8-21-97	Convalescent when admitted	"	"
9	M	20	Clota Mer	8-22-97	Left groin	Nervous	"
10	F	15	.....	8-22-97	"	Digestive	"
11	M	18	Hos. Asst.	8-24-97	.....	.....	"
12	M	25	Do.	8-26-97	.....	.....	"
13	F	24	.....	8-26-97	.....	Pneumonic	"
14	M	12	.....	8-29-97	Right groin	Digestive	"
15	M	20	.....	8-30-97	Pulseless when admitted	"	Death.
16	F	13	.....	8-30-97	Abortive type	"	Cured.
17	M	25	.....	8-30-97	"	"	"

	Sex.	Age.	Occupation.	Admission.	Symptoms.	Type.	Issue.
18	M	19	Servant ...	3 31-97 ...	Left axilla ...	Digestive ...	Cured.
19	F	38	.....	3-31-97 ...	Abortive ...	.....	"
20	F	20	Servant ...	3-31-97 ...	"	.....	"
21	M	18	Do. ...	1- 4-97 ...	Convalescent ..	.....	"
22	M	25	Do. ...	1- 4-97 ...	Left axilla ...	Digestive ...	"
23	F	85	.. ...	1- 4-97 ...	Observation ...	.....	"
24	F	9	Servant ...	3- 4-97 ...	Left femoral...	.....	"
25	M	20	.....	3- 4-97 ...	.....	.....	"
26	F	14	Servant ...	4- 4-97 ...	Right axilla ...	Nervous ...	Death.
27	M	17	Hawker ..	4- 4-97 ...	"	.....	Cured.
28	F	14	.....	4- 4-97 ...	Doubtful ...	.....	.....
29	M	12	.....	4- 4-97 ...	Left axilla ...	.....	.....
30	M	18	Damanwalla.	6- 4-97 ...	Left groin ...	.....	.....
31	M	30	.....	7- 4-97 ...	"	Nervous ...	Death.
32	M	25	Damanwalla.	7- 4-97 ...	Left axilla ...	.....	.....
33	M	11	Gheewalla...	7- 4-97 ...	Left groin ...	Digestive ...	.....
34	M	22	.....	7- 4-97 ...	.....	Nervous ...	.....
35	M	35	Damanwalla.	8- 4-97 ...	None ...	Pneumonic ...	.....
36	M	45	Trader ...	10- 4-97 ...	"	Observation ..	Cured.
37	M	12	.....	11- 4-97 ...	"	.....	Death.
38	M	12	.....	11- 4-97 ...	"	.....	.....
39	M	17	.....	11- 4-97 ...	Right groin ...	Digestive ...	Cured.
40	M	30	Servant ...	13- 4-97 ...	.....	.....	.....
41	F	17	.....	14- 4-97 ...	"	.....	Death.
42	M	32	Cook ...	15- 4-97 ...	Left groin ...	.....	.....
43	M	18	Student ...	16- 4-97 ...	"	.....	Cured.
44	M	19	.....	16- 4-97 ...	.....	.....	.....
45	M	20	Khokaval...	16- 4-97 ...	.....	.....	Death.
46	M	17	.....	18- 4-97 ...	.....	.....	"
47	M	47	.....	19- 4-97 ...	.....	.....	"
48	M	40	Weaver ...	19- 4-97 ...	.....	.....	Cured.
49	M	37	Damanwalla.	21- 4-97 ...	.....	.....	Death.
50	M	10	.....	21- 4-97 ...	.....	.....	Cured.
51	F	7 mon.	.....	21- 4-97 ...	.....	.....	"
52	M	12	.....	22- 4-97 ...	Observation ...	.....	Death.
53	M	16	Cook ...	22- 4-97 ...	Left groin ...	.....	"
54	M	22	.....	22- 4-97 ...	"	.....	"
55	F	14	.....	22- 4-97 ...	Right groin ...	Nervous ...	.....
56	M	60	.....	23- 4-97 ...	Left groin ...	.....	.....
57	M	22	.....	24- 4-97 ...	.....	.....	.....
58	M	50	Shopman ...	26- 4-97 ...	.....	.....	.....
59	F	28	.....	27- 4-97 ...	.....	Convalescent...	Cured.
60	M	26	.....	30- 4-97 ...	.....	.....	Death.
61	M	13	.....	4- 5-97 ...	.....	.....	Cured.
62	M	13	.....	4- 5-97 ...	Right groin ...	.....	.....
63	M	22	Servant ..	4- 5-97 ...	Left axilla ...	.....	Death.
64	M	21	Do. ...	4- 5-97 ...	.....	Observation ...	Cured.
65	M	12	.....	7- 5-97 ...	Right femoral.	.....	.....
66	M	10	.....	7- 5-97 ...	.....	.....	Death.
67	M	20	Shopman ...	8- 5-97 ...	.....	.....	.....
68	F	25	.....	11- 5-97 ...	.....	.....	.....
69	F	25	.....	11- 5-97 ...	Lunatic ...	.....	Cured.
70	M	30	.....	11- 5-97 ...	.....	.....	.....
71	M	18	Servant ...	18- 5-97 ...	.....	.....	.....
72	F	22	.....	20- 5-97 ...	Right groin ...	.....	Death.
73	M	35	Shopman ...	27- 5-97 ...	.....	.....	Convalescent.
74	M	22	Servant ...	28- 5-97 ...	.....	.....	.....

It will be observed that there were several elderly patients (one of 85) who recovered.

That the average age of all patients was 24.

That males show a very large majority.

That those whose occupation was sedentary seemed to be especially affected.

That the groin and femoral glands are more often the seat of bubo than the neck or axilla.

That the pneumonic type is generally fatal.

Futtehalli's Hospital for Borah Sulimans.

PRIVATE HOSPITAL No. 18.

No report was received from this Hospital.

Parel Road—Parsees.**PRIVATE HOSPITAL No. 19.**

No report was received from this Hospital.

Report of Jain Hospital (Lalbag, Bhuleshwar).**PRIVATE HOSPITAL No. 20.**

This hospital opened on 15th December 1896 ; to be closed on 1st August 1897 ; received 206 plague patients, of whom 126 died. (Mortality, 56·3.) Established at first as sectarian, it was subsequently thrown open to Hindus of all denominations by the Secretary, Mr. Manockchand Kapurchand.

Medical Officer—Dr. W. S. Divan.

Staff.

Hospital Assistant—Mr. F. Keshav.

Nurse—Mrs. Jannabai.

Cases	206	} Of these, the following are details :—
Recoveries ...	...	90
Deaths ...	...	116

Sex.				Admitted.	Recovered.	Died.	Mortality.
Male	...	...	...	170	74	96	56·5
Female	...	...	...	36	16	20	55·5
Total				206	90	116	56·31

This mortality, however, is liable to reduction on the score of moribund admissions, of which there were as many as 48 ending fatally within 24 hours.

If these be allowed for, the rate of mortality is 35·4 only. Of the 206 patients, 80 only were Jains.

Types treated—

1. Pneumonic.
2. Gangrenous.

The former the more common.

The general symptoms those usually observed.

Remarks—

- (1) Cervical more dangerous than axillary, and these in turn than inguinal or femoral.
- (2) Hemorrhages proved fatal.
- (3) Survival over the sixth day—a favourable sign.
- (4) Of patients between 7—55 years, the majority were between 18—40.

General treatment—

1. Free change of air.
2. Stimulants.
3. Mild alkaline treatment of *functional secretions*.
4. Warm bath on admission.
5. Calomel with bicarb. soda (*for costiveness and furred tongue*).
6. Bromidia (*for head*).
7. Hypodermic of morphia (*for violence*).
8. Hypod. of strychn. strophanth. (*for heart failure*).

Treatment of glands—

- (1) To induce early suppuration—

Injection of liq. iodi.

In some cases *pure carbolic acid*.

- (2) To relieve the pain—

Application of ext. bellad. and opium and poultices.

Diet—

Milk and congée only during fever.

Report of Parel Road Jain Hospital.

PRIVATE HOSPITAL No. 21.

This hospital, which was opened on 1st April 1897 and which will probably be closed on 31st October 1897, has admitted 22 plague patients, of whom 12 died, and was established, mainly by Mr. Durnjee Lakmieland, for the Cutchi Dasa Visa Osval Shrimaly Community.

Medical Officer—Dr. V. P. Divan.

Staff.

1. Hospital Assistant.
2. Ward boys.

Cases...	...	22	}	Of these cases, the following tabular details are given :—
Recoveries ..	10			
Deaths ...	12			

N.B.—Two cases only were of the pneumonic type.

For the month of April 1897.

Sex.	Admissions.	Cured.	Died.	Remaining.	Total.	REMARKS.
Male	8	1	4	3	8	
Female	6	1	3	2	6	
TOTAL ...	14	2	7*	5	14	

* Three died within 48 hours of admission.

For the month of May 1897.

Sex.	Remained.	Admissions.	Total.	Cured.	Died.	Remaining.	Total.	REMARKS.
Male	3	4	7	3	3	1	7	
Female	2	2	4	2	2	...	4	
TOTAL ...	5	6	11	5	5	1	11	

For the month of June 1897.

Sex.	Remained.	Admissions.	Total.	Cured.	Total.	REMARKS.
Male	1	4 ^o	5	5	5	
Female ... ..	...	...	...	...	...
TOTAL ...	1	4	5	5	5	

^o Two cases were non-bubonic.

General Symptoms—

1. Headache.
2. Nausea and vomiting.
3. Enlarged glands—femoral, inguinal, axillary.
4. Injected eyes.
5. Stupid expression.
6. Delirium or coma.

General Treatment—

1. Pure air.
2. Careful nursing.
3. Stimulants and anodynes.
4. Poultrices to buboes.

Report of the working of the Bombay Port Trust Hospital.

PRIVATE HOSPITAL No. 22.

This hospital was established by the Port Trustees in a position convenient to the Docks at a time when the only other plague hospital in existence was that at Arthur Road. The dock labourers stood in such fear of being taken to the Municipal hospital that they threatened to stop work and leave the City—a course that would have been attended with the most serious inconvenience to the trade of the Port. The prompt erection of a hospital for their separate use at once allayed their alarm and averted the threatened consequences. The Trustees at the same time arranged for the free grant of medical aid to the whole staff. The Medical Officer in charge of the hospital attended daily at the Docks to look after the general health of the men and prescribe for any found ailing.

The hospital was opened on the 23rd December 1896. There were in all five wards including one ward for observation cases. The remaining four wards were used as follows :—

One male ward for serious cases.

One female ward for do.

One male convalescent ward.

One female do.

Besides the above wards, quarters for the relatives of the patients and other necessary out-houses—such as dispensary, store-rooms, cook-rooms, dead-houses, servants' quarters, &c., were also provided.

The Staff consisted of—

A Medical Officer, Dr. Shivdas Parmanandas, I.M. & S.

One Hospital Assistant lent by Government.

One compounder.

Seven ward-boys.

One cook and other servants, such as m..., &c.

Table showing the number of patients treated during the respective months and the results of treatment.

Month.	Remained.	No. of Patients admitted.	Admitted moribund.	Result.		Remaining under treatment at the end of each month.
				Recovered.	Died.	
December ... ..	.....	1	.....	.....	.....	1
January	1	9	3	5	3*	2
February	2	12	4	8	6	.....
March ... ..	.....	27	9	3	14	10
April	10	19	7	14	11	4
May	4	6	3	5	4	1
Grand Total ...	... ..	74	26	35	38	1

By a special arrangement made with Dr. J. Pollen, the observation ward was used for some time for suspected cases of plague sent from the Bunders. Twenty-three such cases were admitted, out of which eighteen developed symptoms of plague and were treated in the hospital.*

The hospital was closed on the 31st May 1897, and the one remaining patient was sent to the Arthur Road Hospital for further treatment.

Dr. Shivdas Parmanandas, the Medical Officer in charge, performed his duties in a most praiseworthy manner and to the entire satisfaction of the Trustees.

* When the Committee assumed charge of plague operations, suspected cases were sent to Modi Khana Government Hospital No. 8 and Wari Bunder Government Hospital No. 8.

Report of Hindu Fever Hospital.

PRIVATE HOSPITAL No. 23.

This hospital was established on 28th January and has been under the continuous general management of Mr. Wadia.

Medical Board.

Dr. Bhalechandra Krishna, Consulting Medical Officer.

Dr. G. B. Khor, }
Dr. M. G. Desai, } Medical Officers in charge.

Dr. S. B. Jathur, Hony. Medical Officer for night duty.

Mrs. Thakubai Praidan, Nurse.

Members of the Working Committee.

Vijbhukandas Atmaram, Esq.	Dwarkadas Dharamsi, Esq.
Tribhowandas Mungaldas, Esq.	Ghanasham Nilkanth Nadkarni, Esq.
The Hon'ble Daji Abaji Khare.	Kushaba Chhajaji Kule, Esq.
Narayan Ganesh Chandawarkar, Esq.	Sudashiv Sakhararam Hande, Esq.
Bhaskarrao Balkrishnaji Pitale, Esq.	Bhiwa Ramji Nare, Esq.
Govindji Thakarsi Mulji, Esq.	Waghu Hanumantrao Boble, Esq.
Ghelabhai Haridas, Esq.	

Honorary Secretaries.

Dr. Bhalechandra Krishna. | Narayan Trimbak Vaidya, Esq.

DETAILS OF CASES.

Admissions 331, of which 254 were fatal: 61 of these within 12 hours; 50 within 24 hours; 9 within 48 hours; and 134 after that period. Buboes were present in 196 cases. Localised as follows:—

1. Femoral	...	...	...	...	...	78
2. Inguinal	...	...	...	...	...	47
3. Axillary	...	...	...	...	...	57
4. Cervical	...	...	...	...	...	6
5. Parotid	...	...	...	...	...	7

The general death-rate was 76·74, the highest but one of all hospitals.

Report of Khoja Plague Hospital.

PRIVATE HOSPITAL No. 24.

This hospital opened on 26th April 1897. Admitted seven cases, of whom four died.

At present on reduced footing.

Cases	...	7	} Of these four one was of a pneumonic type, and death took place 30 hours after admission. Two others also ended fatally within 24 hours.
Recovered	...	3	
Died	...	4	

Medical Staff.

1 Hon. Medical Officer.	1 Manager.
1 Apothecary.	1 Nurse.

Dharavi Hospital.

PRIVATE HOSPITAL No. 25.

Dharavi Hospital was a private institution built by owners of tanneries for their employes on the waste land between the Dharavi tanneries and Mahim Railway Station. It consisted of two wards capable of holding about ten beds each and some necessary out-houses. The staff consisted of one Medical Officer, Dr. Rajabally M. Patel, L. M. & S., one resident compounder, one non-resident Eurasian day-nurse, one resident Mahratta night-nurse, five ward-boys, one chuprassi, one cook, and two sweepers.

The hospital was used solely for plague cases and suspects found among the employes at the Dharavi tanneries. It was opened on the 5th of April and closed on the 31st of May 1897. There were 76 admissions, of whom 37 died and 39 recovered. The institution admirably answered the purpose it was intended for, as the plague which was raging in Dharavi soon disappeared when the cases were isolated by being sent to this little hospital. The above-mentioned four hospitals were all in charge of Surgeon-Captain W. E. Jennings, M.B., District Medical Officer for No. 10 District.

Forms of Plague.

Two forms of plague noticed—

1. Glandular.
2. Non-glandular.

Types or Clinical Headings.

A. Nervous—

Symptoms :

1. High fever.
2. Sudden unconsciousness.
3. Delirium.

B. Typhoid—

Symptoms :

1. No hyper-paresis.
2. Raised temperature (103).
3. Weak and atonic pulse.
4. Coated tongue.
5. Diarrhoea.
6. Muttering delirium.

C. Pneumonic—

Very contagious. Always fatal ; duration two to five days.

D. Convulsive—

Chiefly children under 15.

Symptoms :

1. Albuminuria.

General Symptoms.

- a. Atonic and frequent pulse.
- b. Hurried respiration, inconsistent with pulse and temperature.
- c. Pinched and anxious feature with twitched expression.
- d. General prostration.
- e. Vomiting and constipation (rarely diarrhoea.)
- f. Gland in glandular variety—
 - (1) Tender.
 - (2) Ecchymosed with
 - (3) Inflammation of cellular tissues.
 - (4) Glandular suppuration in favorable cases.

*DECISION OF CAUSE OF DEATH.**In Corpses, Useful Symptoms—*

1. Presence of gland.
2. General congestion.
3. Supplementary history of case.

In Non-glandular Cases—

Failing history of case, the microscopic examination of viscera.

In Doubtful Cases—

1. Previous history.
2. Period of illness.
3. Premonitory symptoms.

General Treatment—

1. Liq. hydrarg. perchloride (large doses, 1½ to 2 oz. in 24 hours).
2. Free stimulation.
3. Ether, digitalis, and strychnia.
4. Quinine when fever is controlled.
5. Food, easy of digestion, administered recumbent and in moderation.

Order of Susceptibility—

Hindu, Bania, Mahomedan, Parsee, Europeans.

Order of Fatality in Types—

Favorable—Glandular and non-nervous.

Unfavorable—Pneumonic and convulsive.

Mortality—60 per cent..

Order of Age Susceptibility—

1. Young adults.
2. Children.
3. Aged.

Order of Sexual Mortality—

1. Males.
2. Females.

Proportion—5 to 2.

Report of Hajee Cassum Joosub's Hospital

PRIVATE HOSPITAL No. 26.

This hospital, date of closing (July 1st) was established by the Mahomedan community of the Rangari Moholla by public subscription among its leading members for the relief of the community and in aid of the Plague Committee. Opened on the 8th of April, it has admitted and discharged one patient.

Hospital Board.

Hajee Cassum Joosub, President.	Hajee Hassum Curim.
„ Ismail H. Hassun.	„ Dawood Ismail.
„ Ahmed H. Hassun.	„ Noor M. Abootalib.
„ John Mahomed Latib.	„ Moss S. Patel.
„ Mahomed Suliman.	„ Mahomed Joosna, Secretary & Treasurer.

Hospital Staff.

Superintendent Medical Officer, Dr. Sidney Smith, M.D.

Medical Officer in charge, Mr. Fernandez, L.R.C.P.&S.

1 Manager and steward.

1 Cook and Ward boy.

1 Dhobie.

1 Sweeper.

Course of the only case admitted.

Male, 45 age admitted 4th day after seizure.

SYMPTOMS—3rd day—

High fever (105°).

Muttering delirium.

• Very low heart action.

TREATMENT—

Careful nursing and free stimulation.

Combined at first with sedatives.

ISSUE—

Convalescence retarded by broncho-pneumonic complication.

Local treatment of affected glands.

Emplastrum Ammoniac.

Hydrargyri.

Linseed poultices.

Abscess formed through suppurated glands, freely opened and dressed twice, with drainage, borie cotton, and light bandage, abscess cavity having been washed with weak solution of perchl. of mercury.

Discharged cured after 27 days in hospital.

Note.—This case is instructive as it shows the advantage of hospital nursing and careful medical attendance without which the patient must have died.

Report of the Telugu Hospital, Kamatipura.

PRIVATE HOSPITAL No. 27.

Established by subscriptions for the benefit of the Moonore Caploo community known here as the Telugu Foolmalie caste. This hospital was opened on April 14th in a building (rent free) known as Anvola Ellapa's Dharamsala. Though its closure is fixed for July 1st, it is to be re-opened on any reappearance of the epidemic.

Hospital Board.

Mr. Karadi Lingoo, President. | Mr. Abbajee Abboo, Treasurer.
„ Manajee Rajoo, Vice-President. | „ Mullo Laxuman, Secretary.

Medical Officer.

Dr. P. J. Svami.

Hospital Staff.

Ward boys 3. | Ayahs 2.
Dhobio 1. | Sweepers 2 (supplied by Municipality).

STATISTICS.

Cases 18 }
Convalescent in hos-
pital, June 19 ... 1 }
Discharged 7 }
Died 10 }

In this hospital eighteen cases in all were treated with the results as marginally noted.

General Symptoms—

1. Of the ten fatal cases, admitted in an advanced state of plague 6
2. Developed pneumonia 2
3. Underwent Dr. Yersin's treatment 1

General Treatment—

Mercury with stimulants.

Report of St. George's Hospital.

This hospital admitted, from 11th November 1896 to 3rd July 1897, 95 cases, of which the following are details:—

Cases 95 } Of the 58 recoveries there were 30
Recoveries 58 } males, 16 females, and 12 children;
Deaths 37 } and of the 37 deaths—males 24,
females 7, and children 6.

Statistics of Nationality.

Caste.	Cases.	Deaths.	Per cent.
Europeans	5	1	20
Domiciled Europeans	8	4	50
Eurasians	25	8	32
European Jews	2	1	50
Asiatic Jews	4	2	50
Native Christians	10	8	80

Assistance given by Religious Bodies.

MAZAGON SISTERS.

The All Saints Sisters went to help in nursing at the Parsee Plague Hospital at the request of the Municipal Commissioner on the 6th January.

There were about 20 patients when they first went there ; they soon increased to 35. When the English nurses arrived, the Sisters gave over charge to them.

On February 6th two Sisters went to the Arthur Road Hospital and found over a hundred patients, all very ill, and no nurses at all. The work was very heavy, and in a few days there were in all five Sisters working there, doing both day and night duty. The first night one Sister was on duty eleven patients died.

The Sisters worked at the Arthur Road Hospital till the end of April, when the English nurses arrived and relieved them.

Another Sister started the work in the Wari Bunder Hospital and worked there till an English nurse relieved her.

Before the arrival of the Nurses sent for by the Plague Committee from England, almost all the nursing in the plague hospitals was undertaken by the Sisters of the different religious bodies described below. Their services were entirely gratuitous, and how much these were appreciated by those to whom they were given will be seen from the following account of their work.

The Thana Hospital was also organised by a Sister sent for the purpose. The Sisters also worked at the Worli, Reay Road, Jamsetji Bunder, and Modi Khana Hospitals. Money and clothes were supplied the Sisters by the public to relieve the urgent needs of the patients. The Dutch Memon Hospital at Pydhownie was supplied with nurses by the All Saints' Sisters.

BANDORA SISTERS.

The following interesting account of the experience gained in the various hospitals by the Daughters of the Cross, Bandora, has been furnished by the Provincial Superior :—At Government House, Parel, were placed six Sisters, who went there on the 21st February ; two Sisters nursed at the Khari Hospital at Bandora, which was opened on the 2nd March. Mahim hospital was opened on the 23rd March ; two sisters were sent there at the request of the Plague Committee.

Their experience shows that the repugnance which all natives have for hospital treatment and their aversion to European methods can be made to yield to kindness. The Sisters give many interesting stories which prove this, out of which the following have been selected as the most striking :—

"A rich Mahomedan, whose grandson was attacked with the plague, came with him to the Khari Hospital and for some time could not bring himself to leave him in the care of the Sisters. But, on seeing the hospital for himself and the attention of the Sisters, he went away content. When, after three weeks' careful nursing, the boy was cured and went back to his home the gratitude of the old man could not be expressed ; he called the Sister who had nursed the boy his daughter, and cried with joy."

In another case at the same hospital a poor woman brought her only surviving son to the hospital and sat by his side the whole day, watching lest the nurses should poison him, as she thought. The next day he became delirious, and, thinking that all was over, the mother ran away in order to avoid seeing him die. Some time afterwards the sister of the patient came to ask for the clothing that the boy had

had on when he was brought to hospital and was astonished to hear that he was alive and recovering. She brought the happy tidings to her old mother, who hurried joyfully to see her boy. The gratitude of the poor woman knew no bounds; she kissed the Sisters' feet and shed abundant tears over them and offered them some poor presents.

Another case was that of a little girl literally snatched from death, who was actually being carried to the dead-house when the Sister in charge told the men that she was not dead, and, in spite of their incredulity, brought her back to the hospital, and by means of stimulants revived her. She afterwards made a rapid recovery.

Another case at Bandora is no doubt typical of many others in which, the parents dying first, the children perished for want of attention. Mr. Gilbert on his daily rounds "found three little Native Christian children huddled together under a cactus bush. Two were attacked by the fell disease—a girl 9 years old and her little brother aged 4. These were nursed, or supposed to be nursed, by another little brother aged about 8 years, the only remaining one of the family, the parents having fallen victims to the plague. The little boy died before Mr. Gilbert had time to take him to the Sisters, but the little girl was conveyed to them. The small brother would not leave his sister, saying that he was in charge of her. Through the care of the Sisters she recovered, and, being destitute and homeless, she has been admitted into the Bandora Orphanage, while her plucky little brother was also admitted into the Stanislaus Orphanage."

At the Mahim hospital an old woman was admitted after all hopes of her recovery had been abandoned by her family. On her recovery, which took place after two months of careful nursing, she showed to the Sisters, on the day when she was discharged, the garment which her husband and children had sent with her, expecting to attend her funeral in a few days.

Perhaps the most remarkable case, recalling, as it does, an account of a similar one in DeFoe, was that of a Brahmin who had previously made several attempts to escape from the hospital. One night at about 11-30, when the Sister on duty went to his bedside and offered him the medicine which the doctor had prescribed, he upset the little glass containing the draught, caught her hands very tightly, and with a violent leap out of bed, made for the door which was close by. Arrived at the entrance of the ward, he ran with great speed towards the sea. It was a clear moonlight night, and the tide was very high. A few yards more, and the man would have taken another leap which would have perhaps proved fatal. Fortunately for him a thorny shrub was in his way, which he did not perceive; he got entangled in it and fell, much to the relief of the Sister and the ward-boys who came to the rescue. He was conducted to bed, his delirium being greater than ever. He lay for several days in this state quite unconscious and very violent. At last a change for the better came: the fever decreased, the buboes burst and were gradually healing. His mind was calm and his strength was returning. He looked occasionally at the Sister by his side and asked her what she had done to cure him. His relations and other patients, who were witnesses of the scene some days previous, then told him how he had acted. He found strength to rise from his bed, threw himself at the Sister's feet, joined his hands like a penitent and wept aloud. He called her his mother and said he would never forget such great kindness as long as he lived.

When it was time for him to be discharged, he refused to go, saying he would gladly spend his life in the service of the Sisters within the Convent walls.

When the trained nurses from England arrived and took over charge from the Bandora Sisters, the patients manifested the greatest grief at losing them. They clung to them, weeping bitterly, imploring them not to leave them, and asking pardon for all their former acts of rebellion.

It was during her attendance on the patients at the Mahim Hospital that Sister Elizabeth, whose death has already been referred to, caught the attack, of which she died.

On the 18th March, seven of the Clare Road Sisters (the Nuns of Jesus and Mary) went to the Grant Road Hospital to work under Dr. Dallas. They were accommodated in quarters in the Northbrook Gardens erected for the purpose. The Sisters stayed there till May 14th. On their leaving, the patients displayed many touching marks of gratitude, and many of those who recovered are still in the habit of visiting the Sisters at their Convent.

The special features of the plague from the point of view of the Sisters who had to deal with it, were the state of filth in which the majority of the patients arrived, the sickening odour of the buboes, and the violence of the patients, many of whom had at first to be tied down to their beds to prevent their leaping out in an attempt to escape. The fortitude with which the Sisters faced these horrors in the performance of their self-imposed tasks was well rewarded by the triumphs over the prejudices of their patients and by the evidences of the gratitude felt by them. In other measures, necessary and well-managed though they were by the officers in charge of them, taken for the suppression of the plague, the people at large at best gave a silent acquiescence. *But the record of services rendered by the Sisters, and the gratitude evoked by them, forms one of the most pleasing pictures in the history of the plague.*

Chapter III.

The Medical Aspect of Plague.

The medical officers working under the Committee both at the Government and Private hospitals were directed to submit their views regarding some of the most salient features of Plague, and the following interesting results of their investigations and observations are recorded. The forms and types of Plague are distinguished by some into simple bubonic and pneumonic plague only, by others as plague (with buboes and without buboes); all the variations on these two forms being grouped under symptomatic evidences of complications, associated with one or other form. Another variety is included by several writers under the names of the gastro-intestinal-mesenteric, enteric, or abdominal form, and there is a tendency to indicate a fourth variety with marked brain symptoms as a cerebral type, and a fifth or nephritic form. Some few very rare cases occurred in which carbuncles were the prominent symptom. In the bubonic form the disease is characterised by the development of glandular swellings in some one of the gland areas, the femoral, the inguinal, the axillary, or the cervical regions, and each may again be classified as a mild or severe form of the type. The mild form was sometimes unaccompanied with marked febrile symptoms. Certain such cases may be described as an abortive form of Plague, and are characterised by the formation of buboes, fever of a low type, and slight constitutional disturbance. They terminate in recovery in about 10 days. The proportion of the types seemed to vary with the progress of the epidemic in the later months of its prevalence,* as shown by the following table of observations from the Cutchi Memon Hospital :—

		In the beginning.	Later.
With Buboes ... {	(a) { Mild form without febrile symptoms ...	2 %	5 %
	{ Mild form with febrile symptoms ...	1 %	20 %
	(b) Severe form ...	95 %	65 %
Without Buboes.. {	With lung complication ...	1 %	5 %
	Without lung complication ...	1 %	5 %

The table also shows that as the epidemic proceeded an increase took place in the mild types of Plague with buboes and with or without febrile symptoms, and also in the non-bubonic types, whilst there was a corresponding decrease in the severe forms of the bubonic types. This result is due to an attenuation of the poison, and a diminution of the virulence of infection by the passage of the virus through many individuals; also the converse may occur, and cases of the mild form undoubtedly occurred in the month of October 1896, in certain districts, which were followed by a severe outbreak of the disease, Byoulla being a particular instance. These mild cases might be importations from a badly-infected region which, unless promptly segregated, might be the means of starting a large and severe epidemic amongst an unprotected population. A warning of this kind seems to have occurred in Calcutta, and it is possible that the active measures taken with regard to a few mild cases in that city, and subsequent careful inspection of ingress traffic may have prevented the disease from gaining a foothold there.

Reviewing opinions generally, the following is a rational classification of forms of Plague:—

- | | |
|---|--|
| 1. With enlarged glands (gravity according to symptoms and severity of attack) | { Femoral.
Inguinal.
Axillary.
Cervical.
Tonsillar. |
| 2. Without enlarged glands (almost always fatal) | { Septicæmic.
Pneumonic.
Mesenteric, enteric or
Gastro-intestinal.
Nephritic.
{ Cerebral. |

The characters of the forms and types are due to a variation in the method of entry into the body of the poison which is the direct source of the disease and common to all. The forms and types may be mixed so as to produce a combination of the characters of two or more, and each may be varied by a degree of intensity, mild, severe, or hæmorrhagic. The hæmorrhagic condition is more often associated with those types of the disease in which the glands are not enlarged, and is always most grave as it shows great destruction of the blood constituents. The hæmorrhages may be petechiæ, or extravasations or exudations from the mucous tracts.

It must be carefully observed that the diagnosis of a type is not made upon the complications which are likely to occur in all. Many cases of the form with buboes show complications affecting the lungs or the brain; but the type is a definite one, and the complications are distinct from the evidences of a type.

The relative proportion in which the different types occur is fairly represented by the following records:—

Port Trust Hospital.

				About.
Enlargement of cervical glands	...	...	...	5½ per cent.
" axillary "	...	...	...	14 "
" femoral, inguinal glands	...	...	...	48 "
" mixed variety	...	...	...	2½ "
" abortive "	...	...	...	28 "

In No. 10 District:—

With enlargement of glands generally	...	...	...	85 per cent.
" " femoral and inguinal glands	...	...	...	60 "
" " axillary	...	...	...	17 "
" " cervical	...	...	...	9 "
Pneumonia type	...	...	...	12 "
Gastro-enteric type	...	...	...	3 "

Signs and Symptoms.

The possibility of such a classification of plague as the foregoing shows that each type has characteristic signs and symptoms due to the typical development of the case, but at the same time there are certain general symptoms common to all cases which are due to the virus, the fountain-head of all the manifestations of the disease. These are now well known, and with them are associated the different features of some one or more types, so that the general symptoms are the basis of the diagnosis of the disease, while the local or visceral conditions constitute the revelations of the type.

The onset is, as a rule, very sudden, and commences with a more or less severe rigor, followed by a rapid rise of temperature, or there may be only a sudden rise of temperature. The countenance has an expression of fear; there are nausea and often

vomiting which may be severe and constant, intense headache, injection of the ocular conjunction, and a feeling of great prostration, aggravated by the vomiting and, further, by inability to sleep, which is a marked symptom. The character of the tongue is a definite one, and the patient is irritable in showing it and does so in a jerky way, or moves it rapidly from side to side when protruding it. It is moist and thickened, the edges and tip are clean and coloured from light to deepish red, and it is coated on the rest of its surface with a thin fur, often of a peculiar white glistening appearance, or of a light reddish brown colour. There is also a perceptible impediment in the speech.

The pulse varies in rate from 100 to 140, and also in volume; usually it is full, soft and dirotic, the latter sign being recognizable even in the early stages of the disease, and it becomes thready as the heart's action gets dangerously weak. The bowels are generally constipated, often to an obstinate degree, but in some cases they are relaxed, and the motions then have a peculiarly offensive smell.

There may be also a short dry cough, and a darting pain in some lymphatic gland regions. The urine is highly acid and rapidly decomposes on standing, triple phosphates being deposited, and the specific gravity varies from 1040 to 1035. The urea and uric acid are diminished, and albumen is present in a number of cases.

With the progress of the case the temperature rises quickly, usually reaching a maximum of 103, 104, or higher about the third or fourth day, though in severe cases earlier; the pulse becomes weaker, and in the worst cases the temperature rises very high and the patient succumbs to the peculiarly exhausting effects of the disease in a very short time: 24 or 48 hours, or even less. If the patient survives the acute early stage, the febrile symptoms are more aggravated with the rise of temperature, the pulse becomes thready, the tongue is less moist and more irritable at the tip and edges, while the prostration and insomnia increase and cause a look of deep anxiety and distress.

In those cases where cerebral symptoms supervene, certain features manifest themselves about the third day, which are due either to congestion of the nervous centres or to involvement of them in the septicæmic process. The look of anxiety now gives way to heavy expressionless countenance, which is liable to be mistaken for an improvement, but is really due to want of control over the muscles and loss of tone in them. The patient is sensible of all that goes on near him, but appears to be only partially conscious, listless, and drowsy, and it is with difficulty he can be made to hear distinctly. His speech is thick and indistinct from loss of power of co-ordination of muscular movements, which is noticed also in most of his other muscular efforts; and these effects are due, not only to an implication of the cerebral and spinal centres in the toxicæmic results, but also to some general peripheral neuritis, the results of which continue as sequelæ in some of the cases. There may be also cramps in the muscles. In other cases there is great irritability of the cerebral centres, which is shown by violent delirium. The further progress of the case depends upon its circumstances according to type, and in those cases where the symptoms peculiar to the type improve and the temperature goes down, the cerebral symptoms remain for some time and then gradually subside. When the primary symptoms increase or the type is complicated, the symptoms attributable to the nervous system may assume the form of violent delirium or coma vigil, the latter being most grave.

The general symptoms above detailed characterise all the types of plague, and the adjunctive features peculiar to each type may receive brief mention.

The glandular or bubonic is the common form of plague, and comprises about 80 to 90 per cent. of all cases. Coincident with all or some of the general symptoms, one or more swellings appear at some one of the positions in which

lymphatic glands exist, the usual ones affected being those of the femoral region, and those less commonly affected being the glands of the anterior axillary and cervical regions. The swellings sometimes appear at the onset, usually on the second or third day, and often not until later, in the course of the attack. They consist of single glands, chains of glands, or two or more separate glands agglomerated into a mass. The skin over them is warm, tense if the bubo be large, and very tender. Sometimes they subside and gradually disappear. Very often they suppurate and burst, and a sudden rise of the temperature in the course of an attack generally indicates the appearance of a fresh bubo.

The tonsillar type is a very peculiar one, and is characterized by great swelling of the tonsils and the glands of the neck on one or both sides. There is also nasal catarrh; and the appearance of the patient is strange, with the large swollen neck, open mouth, and inflamed sore nose, from which secretion runs. The great dangers of these cases are asphyxia from oedema, and cellulitis extending down into the chest.

The septicæmic type is characterised by an intensity of the general symptoms due to direct entry of the virus into the blood. Enlarged glands may appear in several regions later on.

The pneumonic or thoracic type is that variety in which the lungs are primarily infected, most probably by inhalation of the virus, and one or both of the lungs are attacked most commonly with lobular pneumonia, although conditions indicative of lobar pneumonia are also sometimes found. An abstract of the report of the Russian Plague Commission read by Professor Wysokowicz before the Bombay Medical and Physical Society shows that after a certain period the patches of the lobular pneumonia coalesce so as to form circumscribed areas of exudation in healthy tissue, and that the whole-lobe is never consolidated in plague pneumonia, as it is in lobar pneumonia. This type is very fatal, and in severe cases is occasionally complicated with the development of external buboes, which arise from a secondary extension of the virus.

The gastro-enteric or abdominal type as a primary form of plague is rare, and the earlier symptoms are difficult to distinguish from those of the tropical enteric fever which they greatly resemble. The diagnosis would mostly depend upon the general symptoms and the peculiar form of the abdominal symptoms which are its leading features. The eruption, if there is any, is more petechial in character; the abdominal distension appears early and has not the signs of that which occurs in typhoid; also there are severe lumbar pains, retching and vomiting, and inability to gain rest except in certain postures. If diarrhoea occurs, the characters of the stools do not resemble those of typhoid; the bowels may be inactive, but this is by no means a criterion, as many cases of tropical typhoid fever are accompanied with constipation in the early phases. The diagnosis must rest on the recognition of the general symptoms, the early appearance of abdominal distension, the characters of the stools, and bacteriological tests, and examinations of the blood. A variety of this type has been seen which is choleraic in character, the predominant symptoms being an imperceptible or only slightly perceptible pulse, cold extremities, and excessive vomiting and diarrhoea. The presence of a high temperature as indicated by the thermometer would indicate the nature of the disease.

A symptomatic effect which has been seen in the glandular form of plague is one of *hydrophobic symptoms*. It has been described as a *hydrophobic type*, the prominent symptoms being a terrified expression, difficulty in swallowing fluids, inability to spit or expectorate, and extreme restlessness. The fever and the bubo reveal the true nature of the illness, and the hydrophobic symptoms may be a hysterical display of the terror with which the disease is associated.

Ready method of diagnosing plague.

The signs and symptoms of plague and the features of each type being thus capable of early recognition, a summary can be made of the ready methods of diagnosing a case of plague of three or four days' duration (at which period the cases usually come to light) and directions were given in accordance with them to the Justices of Peace, Chief Constables, and others working under the Medical Officers of the Committee's staff. The instructions were very useful in saving the time and strength of the doctors, as the search parties would have often called upon them unnecessarily, since no case could be taken to the hospital without being seen by a doctor first. Enquiries should be carefully, quietly, and judiciously made on the main characters of the disease from the friends and relations of the patient, and—if he is conscious—out of his hearing, as the terror incidental to the disease may be increased and the dangers of emotional distress thereby added to. We should thus discover that the onset was sudden, characterized by high fever, preceded by a shivering fit; the whites of the eyes are congested; the pulse is quick and can be easily stopped by the pressure of a finger; the tongue is furred white, or yellow, and red and bright at the tip and edges; the expression is dull and listless; the speech is thick and indistinct; there is loss of power in the limbs, or the hands will not perform the usual movements with accuracy, and the patient fumbles over them. There is swelling of the glands in some of the regions or groin, the armpit or the neck, and these swellings are very tender; there is nausea and vomiting and the bowels are constipated.

If there are no glandular swellings, there is cough with expectoration, and the general symptoms are suspiciously like those of plague; if there are diarrhoea, vomiting, abdominal distension and pains in the loins, but there are no swellings or cough, and even if there are only some of the general symptoms present, the case should be kept under careful observation until it has been diagnosed by an expert.

The convalescence of plague patients is often very protracted, and even for a considerable time after recovery there is great danger lest any unwonted exertion should cause sudden failure of the enfeebled heart's action. In cases that recover quickly, the patient's condition begins to improve after about a week, and in a fortnight he is fairly well. The sequelæ are dimness of vision; panophthalmitis, sometimes leading to sloughing of the cornea and blindness, suppuration of various glands, boils, anæmia, great debility and emaciation, nervous symptoms, such as aphasia, dementia, partial paralysis, especially of the lower extremities, and in other cases a condition of general partial peripheral neuritis which lasts for a considerable time.

Treatment.

It is difficult to recommend any particular line of treatment with confidence, for it is often seen that a plan of treatment which succeeds in one case totally fails in another. It may be shortly summed up as nutritive, stimulant, antiseptic, antipyretic, and local.

The general treatment is directed towards checking the development of the virus as far as possible, keeping up the strength of the patient to the utmost, and treating various complications as they arise. Rest, careful nursing, quiet, dieting and good sanitary conditions are most essential as a basis of treatment. Plague patients must invariably be treated in large airy well-ventilated rooms, quite free from overcrowding, which must be kept scrupulously clean. The great error in the management of

the epidemic in its earlier stages, has been to sacrifice these all important needs to the fear of the risks connected with removal of the patients, which are reduced to a minimum if carefully and scientifically carried out. There is now no doubt that it is criminal to allow a plague patient to remain in a close, ill-ventilated, confined room, which is sure to be to his disadvantage, as well as a danger to others, and all classes of natives are now well aware of this from their personal experiences during the epidemic. The hygiene of the patient must also be thoroughly seen to, and immediately on admission he should be washed with hot water and sponged with antiseptic solution.

Diet.

Rice gruel with milk in small quantities and given frequently was found a good staple diet for all plague patients ; it relieves thirst and is easily digested. Milk with equal parts of soda-water also answers well. The diet should always be principally milk and farinaceous food. The special food preparations of Mellin, Benger, Savory and Moor, or Carnrick Frame Food, corn flour, barley flour, sago are most useful. If there is no caste objection to animal food, soups and broths can be also given, and no doubt help to support the strength. The greater mortality and liability to attack amongst the vegetarian Hindus indicates that amongst them the constitution was vulnerable to the disease to a much more marked degree, than amongst non-vegetarians. Special preparations of meat essence given iced are very useful and virol has been extolled as being very efficacious. A teaspoonful of virol with two teaspoonfuls of brandy and an ounce of water was given frequently and with advantage in some cases. Liebig's extract, Valentine's meat juice and jelly are also useful. Care should be taken not to overload the stomach, as it is likely to hamper the action of the heart. There is a marked instance of this in case No. 1 (a ward orderly, p. 94), in the Grant Road Hospital report. The food should be liquid, given in measured quantities at regular intervals, and in the earlier stages of pyrexia it should be iced. On account of the difficulty of supplying good fresh milk and the liability to fraud, condensed milk was used in some of the hospitals. It is less palatable than fresh milk and not so satisfactory, but it is a good stand-by in an emergency. Peptonised foods, milk especially, are of great service, and in certain cases where the atony of the intestinal tract is marked they are indispensable, and should also be used in all cases where there are signs of much impairment of the digestive functions.

Medical Treatment.

Calomel.—Having purgative and antiseptic properties, a full dose may be administered at the outset, and, if necessary, be followed by a saline purge. If the condition of the patient renders the administration of medicines difficult, repeated small doses of calomel may be placed on the tongue and washed down with brandy and milk.

Liquid hydrarg. perchlor. in fairly large doses ʒii (two drachms) every two hours for a few doses and ʒi (one drachm) to be continued afterwards. The effect of the mercury on the gums in cases of true plague seems tardy while in other fevers its speedy action renders its abandonment necessary. It certainly mitigates delirium and reduces the fever. It is noticeable that syphilitised patients inured to mercury suffer less severely than others when attacked by plague and this result amongst the public prostitutes has been a matter of general comment. The experience of the Parel Government House Medical Officer shows that large doses can be administered with benefit.

Other drugs have been used for their antiseptic properties, e.g., salol, jinkol, carbolic acid, sulphocarbolate of soda, thymol. The nervous symptoms require skilful

attention. Insomnia is often difficult to overcome; and may be treated by chloral bromides and Opium, but with great caution, as the former adds to the cardiac depression, and the latter must be avoided if there is any tendency to coma, pulmonary obstruction, or suppression of urine. Sulphonal, tehonal, and urethane are useful. The ice-bag and evaporating lotions are often effective, and in coma vigil, liberal stimulation must be used. If lung symptoms appear the treatment must be that usually adopted in pneumonia. Vomiting can be controlled sometimes by sucking ice, minim dose of vin. ipecac., and a mustard plaster over the epigastrium.

Treatment of Hyper-pyrexia.

Drug treatment is useless and harmful as the antipyretics are cardiac depressants.

Ice-bag to the head, cold sponging, or rubbing with ice, continuous cold packing are the measures that have been most commonly adopted. The bath is objectionable on account of the great disturbance to the patient. Every process of this kind requires careful watching as the temperature sometimes runs down and collapse supervenes.

Diaphoretics and diuretics are useful in helping to carry off the toxic accumulations in the blood and secretions.

The danger of sudden failure of the heart's action makes it imperative to avoid movement on the part of the patient as much as possible. Careful removal and change of position by skilled hands and appliances can be done without much risk, and the great difficulty is to prevent the patient from sitting up, or his friends from letting him do so. To combat this tendency to fatal syncope alcoholic stimulants, either subcutaneously, amyl nitrite, coffee ammon carb, musk strychnin : by mouth or subcutaneously are administered together with cardiac tonics, strophanthus digitalis, convallaria, and caffeine citras; hot water bottles to the extremities and mustard plasters over the epigastric and cardiac regions are useful. In the later stages of the disease it is advisable to empty the bladder periodically with a soft catheter.

Local Treatment.

At a certain period of the epidemic when it was found that many of those cases recovered in which suppuration of the glands took place, attempts were made to provide an outlet for the virus at the site of the local inflammation, and so the buboes were incised, canterised, branded or scarified, or leeches were applied. No improvement resulted and the methods fell out of use. Some experiences show that it is actually dangerous to the patient to incise or prick a bubo as the disease thereby becomes generalised by direct infection of the blood, and no bubo should be touched with a knife or capillary tube during the acute stage. In two mild cases morbid material was taken from buboes by means of capillary tubes; and in both instances the patients died, the disease becoming quickly generalised! Injections into the substance of the glands are open to the same objection, and solution of tincture iodi, acid carbolio, potas permanganatis have been used for this purpose with doubtful effect.

The application of extract of belladonna, emplastrum hydrargyri poultices and fomentations are useful to alleviate pain and tension. When the glands suppurate, free incision, evacuation of the pus, and drainage, together with firm pressure are followed by fairly rapid healing and with very little scar. As a rule and if properly treated, the suppurating bubo of plague differs in this respect from the syphilitic bubo, which is sluggish, unhealthy, and slow to heal.

The Special Methods of Treatment.

* The special methods of treatment of plague are those of the prophylactic or anti-microbial and the anti-toxin serum treatments, of which the chief exponents are M. Haffkine, C.I.E., and Dr. Yersin.

The Committee facilitated the application of such treatment as far as possible, and the Medical Officers of plague hospitals were ordered to take special notes of the same, so that all cases were studied and watched with the keenest interest.

In order to understand the subject, it must be borne in mind that the effects of plague and its symptoms are due to chemical toxins produced by a living diplo-bacillus acting on the fluids and tissues of a living animal body.

The principle of that form of treatment of plague with which M. Haffkine's name is associated, *viz.*, the prophylactic or anti-microbial treatment is one of prevention or modification of the disease by injecting into the body graduated doses of the plague chemical products.

M. Haffkine had already applied this method to the preventive treatment of other diseases, such as cholera and typhoid fever, and he has been working in Bombay with indefatigable enthusiasm, since very early in the course of the epidemic, to produce a similar method of preventive treatment for plague.

* * The basis of the process is to make cultures of the plague bacillus of a certain strength in a tificial fluids possessing high nourishing properties with regard to these microbes, and after the bacilli have had a defined period of activity in the fluid, they are killed by the application of a standard degree of heat, disintegrating as little as practicable their chemical products. This mixture of soluble toxins and suspended dead bacilli is then injected under the skin in very carefully-measured quantities, and mild re-actionary symptoms of plague are thereby produced.

By repeating the subcutaneous injections (or inoculations as they are popularly termed) the system is modified by the artificial toxins, and its tissues are thereby rendered immune and resistant to the poison of living plague microbes. The difference between the symptoms of the prophylactic treatment of plague and those of true plague is both one of degree and of kind. In the former the toxins are very moderate in amount and calculated on most careful and thorough scientific principles according to the degree of resistance of the body to their reaction, which is also arrived at by an intricate series of experiments; moreover, no living virus is introduced into the system. In plague the tissues and fluids of the host are invaded by the living active bacilli and have no resisting effect against the reproduction of the micro-organism which proceeds with great rapidity and with such overwhelming intensity that the poisonous effects are irresistible and fatal to those attacked in the proportion of from 50 to 100 per cent. according to the virulence of the microbe and the susceptibility of the host, both of which are liable to variation. M. Haffkine has applied his treatment to many thousand people, but in the 2,538 patients that have come under the observation of the Committee in the plague hospitals only three cases were admitted in which this treatment had been but partially tried (*i.e.*, they had not had the full number of saturation doses given them), and they all recovered. M. Haffkine's report will no doubt deal extensively with this subject.

The anti-toxin serum treatment with which Dr. Yersin's name has been so prominently associated is based on an entirely different scientific principle to that of the prophylactic treatment. It is a direct form of treatment, and its aim is to cure or alleviate the disease when the individual has been attacked by the living virus and already shows symptoms of plague. It rests on sound and well-proved laws of bacteriological science, which show that the ravages of a disease of the same nature as plague can be controlled by adding to the fluids of a body which has been invaded by the bacillus a material which has a resisting power to the development of the disease.

This material is obtained in the serum of an immunized animal, the horse being selected as the best subject for the process.

By a series of elaborate operations the animal is inoculated with the virus through such degrees that it is finally brought to a stage of great immunity to lethal doses of the active microbe. It is then found that the serum of the blood of such an animal when injected into another effectively hinders the reproduction of the bacilli and the formation of toxins. When the subcutaneous injection of this fluid in measured quantities (all determined by careful experiment) is made into the body of a person already attacked with plague, it mingles in the tissues and circulating fluids, and by its action is expected to restrain a further development of the bacilli.

It is therefore clearly of the first importance to apply the treatment in the earliest possible stage of the disease before any great numbers of the bacilli have developed and before any large quantities of the toxine have been produced in the system.

When Dr. Yersin commenced his operations in Bombay, he extended the treatment to all classes of patients in every part of the city, so that it was impossible for any one but himself to compare his results. He communicated them to the Committee according to the accompanying statement, and they fell far short of the expectations and hopes of the public and of the medical profession.

Statement of Cases treated by Dr. Yersin's anti-plague serum.

17 cases treated on 1st day of illness ...	{ Cured 15 Died 2 }	Mortality... 12 per cent.
17 " 2nd " ...	{ Cured 11 Died 6 }	" ... 35 per cent.
12 " 3rd " ...	{ Cured 6 Died 6 }	" ... 50 per cent.
3 " 4th " ...	{ Cured 1 Died 2 }	" ... 66 per cent.
1 " 5th " ...	{ Cured ... Died 1 }	
Total of 50 cases treated...	{ Cured 23 Died 17 }	" ... 34 per cent.

Cases treated classed by Nationality.

2 European*	{ Cured ... 2 Died ... }	Mortality ... Nil.
9 Eurasians	{ Cured ... 5 Died ... 4 }	" ... 44 per cent.
23 Hindus	{ Cured ... 13 Died ... 10 }	" ... 43 per cent.
7 Mahomedans...	{ Cured ... 5 Died ... 2 }	" ... 28 per cent.
10 Parsees	{ Cured ... 9 Died ... 1 }	" ... 10 per cent.

Remarks by Dr. Yersin.

"The serum used in these experiments was supplied by the Pasteur Institute of Nha Trang. It had to be prepared in great haste, so it was weaker than that used last year in China, and the doses to be injected consequently had to be largely increased.

"In the mortality returns cases will constantly occur where the patient has died within 12 hours of the injection of the serum, showing that it has not had time to act. If all such cases which cannot properly be reckoned among the cases treated were eliminated, the percentage of the deaths would be much less than 34 per cent.

"In future experiments better results will be obtained with a more powerful serum if injected at once and in sufficient quantity.

"A scientific report, with detailed statements of all cases treated, will shortly be published in the annals of the Pasteur Institute at Paris."

When the circumstances under which the treatment was being carried out came to the notice of the Committee, they requested Dr. Yersin to confine his operation as much as possible to the plague hospitals, so that the cases might be under the observation of the medical officers working under the Committee.

These observations are recorded in the special reports of the hospitals in which the cases were treated.

The results thus seen in the Bombay plague hospitals are not favorable, and the following is a brief *resumé* of them :—

Dr. Yersin's Treatment.

Hospital.	No. of Cases.	Recoveries.	Deaths.	Per cent. of Mortality.
Parel	23	10	13	56.5
Sahebs' Servants	4	1	3	75
Chiarni Road	4	2	2	50

* In this case there was some diversity of opinion as to whether it was a true case of plague.

Including all the cases treated and giving the most favourable results, the results are :—

The total number of cases treated	34*
The total number of recoveries	15
The total number of deaths	19
The percentage of mortality to cases	55.1

* Inclusive of 3 cases rejected by Dr. Thompson.

Despite the apparent failure of the treatment to have an appreciably beneficial effect on the disease, the Committee wish to draw attention to the facts that it is based on sound laws of scientific experiment and research, that these have not yet reached the full perfection which it is reasonable to expect, that the serum first used by Dr. Yersin was of feeble immunizing power, and that the subsequent operations of Dr. Yersin at Cutch Mandvi with anti-toxin serum of a higher standard than that which he used in the first instance in Bombay, were attended with more commendable results.

We may mention that M. Haffkine has also carried on researches for the production of an anti-toxin serum and that further interesting and valuable communications may be expected from him, as well as from Dr. Yersin and the other scientific men and missions who have been eagerly investigating this particular and all-important subject.

In his report on the Jain Hospital, Lalbag, Bhuleswar, Dr. Dwyer mentions cases of inoculation by Professor Haffkine and Dr. Yersin (see Report, Private Hospital No. 20 and of "Recurrence").

Professor Haffkine.—In the first of these, two brothers, who arrived in Bombay from Damaun, were immediately inoculated by Professor Haffkine. Both, however, were attacked by the epidemic, the one on the sixth and the other on the tenth day after their arrival.

As the one died and the other recovered, it may be reasonably inferred that the former had already contracted the disease before arrival.

Dr. Yersin.—Three cases were also treated with Dr. Yersin's serum—one male and two females. The male alone recovered.

Recurrence.—Here the patient's first attack was in February. He developed the usual symptoms of high fever (T. 105°) and an enlargement of the gland (left femoral).

The case, however, proved a mild one. He was convalescent in a week and made a rapid recovery.

Two months later he again fell a victim, presumably through domicile with a patient on whom he was in close attendance at Matunga.

On this occasion the gland suppurated and was removed by operation.

He made a very tardy recovery, after remaining two months in the hospital.

The Signs of Plague after Death.

The signs of plague after death are of particular importance in deciding how the corpse should be disposed of, and whether measures should be taken for disinfecting or destroying the house and articles of furniture and clothing; which must be done if the person has died of plague.

In the absence of any history, or the refusal of relatives and neighbours to give any information, there are certain external evidences of the cause of death, particularly the enlargement of the glands which are to some extent reliable. The discovery of the plague bacillus under the microscope in specimens of the blood and juices or in cultures from the same would of course finally decide the question in most cases, but still in some it is necessary to perform a complete internal *post mortem* examination also in order to be quite certain. If the position of the body has not been altered after death, it will invariably be found lying on either side with the knees flexed and the head leaning towards the chest; rigor mortis is delayed; there is softness and want of cohesion of the fibres of the muscles; the thumbs point towards the palms of the hands; the features have a fixed anxious expression; the eyes are sunken and muddy in aspect with a peculiar lustre of the cornea, the pupils being dilated and the lids half closed; the tongue is swollen and coated with fur of a glistening appearance and is clean at the tip and edges; the fur is dry, white or yellowish-brown, cleft down the centre, and horny. The complexion is opaque and dingy, the skin is dry, and, if death has been recent, the forehead and hands are cold and clammy; and enlargement of the glands in one or other locality would decide the opinion that death had been due to plague.

If death occur during delirium or convulsions, there may be distortion of the features, in which, if the patient dies while on his back, the head is thrown to either side and the legs are separated. Petechial spots may also be noted, although in the epidemic in Bombay they have been comparatively few. In death from pneumonic plague the body and face have a dusky bluish livid hue, sputum hangs round the lips, and the body seems shrunken and collapsed.

(1) From the attached statement it appears that the 33 hospitals, which have sent in returns, have

Admitted in all ... 2,538 patients.

Of whom ... 1,438 died.

This gives a mean mortality of 56·3 per cent. *

(2) The rates of mortality are thus distributed among the hospitals:—

				Per Cent.	
The returns of 2 hospitals lie between				...	...
	0	do.	...	...	0—10
Do.	2	do.	...	...	10—20
Do.	4	do.	...	...	20—30
Do.	4	do.	...	...	30—40
Do.	9	do.	...	...	40—50
Do.	7	do.	...	...	50—60
Do.	3	do.	...	...	60—70
Do.	0	do.	...	...	70—80
Do.	1	do.	...	...	80—90
			...	...	90—100

			Cases.	Deaths.
1. The highest rate is 100 per cent.	Falkland Road	...	3	3
2. The lowest rate is 0·0 do.	Khatri Mahan	...	2	...
3. The mean of these 50 do.	Wari Bunder	...	56	28

RETURN showing the Mortality from Plague, Percentage of Deaths and Cases in all Hospitals.

A.—GOVERNMENT HOSPITALS.

No.	District Hospital.	Cases.	Deaths.	Sections.	Death rate per cent. of Cases.
1	Pilct Bunder	34	20	Upper Colaba	58·8
2	Jamsetjee Bunder	33	19	Lower Colaba	57·5
3	Modi Khana	18	6	Fort, North	33·3
5	Charni Road	70	45	Dhobi Talao	64·2
6	Grant Road	374	225	Market	33·3
6a	Foras Road, Police	28	16	Tardeo	28·1
8	Wari Bunder	56	28	Tarwadi	50·00
10	Reay Road...	22	8	Mazagon...	36·3
14	Arthur Road	321	180	Khetwady	56·07
15	Parel Government House	304	196	Sion	64·4
16	Sion...	67	23	Mahim	34·3
17	Bandora	41	32	Bandora...	75·04
18	Worli	44	11	Parel	25·00
19	Ripon Road, Jullais	50	22	Syculla	44·00

B.—PRIVATE HOSPITALS.

District No.	District Hospital.	Admissions	Deaths.	Sections.	Death-rate per cent. of Cases.
	DeSouza Street, for Lohana, Cutchi, Hallai Gogari community.	P. 79	20	Fort, South	63·2
	Modi Khana, for Sahebs' Servants.	P. 82	62	Esplanade	75·6
	Mint Road, by Govindji Thakarsi Mulji, for Bhattias.	P. 33	25	.....	75·7
3	Jackaria Masjid Street, for Cutchi Memons.	P. 19	8	Mandvi, Chackla.	42·1
	Clive Road, for Dussa Sa Bannias.	P. 47	31	Oomurkhadi Dongri.	65·9
	Memon Mohulla Street, for Hallai Memon.	P. 3	2	.....	66·6
	Kolsa Street, by Haji Cassum Mitha, for Memon Sunnia.	P. 1	0	.....	0·0
	Carried over	...	772	448	.....

B.—PRIVATE HOSPITALS—*contd.*

District. No.	District Hospital.	Admissions	Deaths.	Sections.	Death- rate per cent. of cases.
	*Brought forward ...	778	448	.....	...
	Imambra, Oomarkhadi, by Aga Abdul Hussein, for Moguls.	P. No returns.			
	Tantaspura Street, Khoja Hospital.	P. 30	18	.....	6.0
	Nagdevi Street, General Mahomedan Community.	P. No returns.			
	Bhotwada, Bhuleshwar, for Marjadi Vaishnav Bunnia community.	P. 6	2	Bhuleshwar, Kharatalao and Kumbarwada.	62.5
	Pinjrapol, for Marwaris...	P. 8	5		
	Ohattri Sarang Street Hospital, for Kokani Sunnis.	P. No returns.			
	Nizampara, Bapu Huzar Street, Bhendi Bazaar, for Kokani Sunnis.	P. See page 120.			
	Bapu Khote Street, for Kattiri Mahomedans.	P. 2	0	.....	0.0
	Gol Pitha, Falkland Road, for General Mahomedan community.	P. 3	3	.....	100.0
	Charni Road Hospital, one ward provided by Chubildas Lalooobhoy, for Bhangali Caste.	P. No returns.		Fenaswadi, Girgaum, Chaupati.	
	Charni Road, by Adamjee Peerbhoy, for Borah community.	P. 75	38	.....	50.6
6	Telugu ...	18	10	.....	55.5
7	St. George's ...	54	44	.....	44.4
	Khetwadi Futtchali's Hos- pital, for Borah Suliman community.	P. No returns.			
	Parel Road Parsee Hos- pital.	P. Do.			
	Arthur Road Jain Hos- pital.	P. See page 124.			
	Parel Road Jail Hospital.	P. No returns.			
	Port Trust Hospital ...	P. 74	38	.....	57.3
	Connaught Road Hindu Hospital	P. 331	254	.....	50.
	Connaught Road Khoja Hospital.	P. 15	8	.....	53.3
	Dharavi Borah commu- nity.	P. 76	37	.....	48.6
	Total ...	2,538	1,438	.....	56.66

Note.—G stands for Government, and P for Private.

The main features of the mortality are thoroughly dealt with in the individual reports of the various hospitals.

The mortality amongst females is higher than that of males.

	Women.	Men.
Parel Government House Hospital ...	71 per cent.	68.6 per cent.
Grant Road Hospital ...	64.04 „	58.47 „

Pregnancy has an undoubted unfavorable influence especially when the duration is of more than three months.

	Cases.	Aborted.	Died.	Recovered.
In Parel Hospital there were	4	4	4	0
„ Pilot Bunder ...	2	2	2	0
„ Grant Road ...	4	4	2	2
	10	10	8	2

Percentage of mortality 80 per cent.

The largest number of deaths took place between the ages of 20 and 40 years, corresponding with the number of attacks which are also largest during that period. The percentage of mortality to attack is highest at the ages of 5 and 50, and is nearly as high between the ages of 30 and 45.

The mortality is greatly affected by the state of the patient on admission. For instance, the general mortality of the Parel Hospital was 64.5 per cent., but of cases that survived 48 hours, 80.8 per cent. only died, shewing that the circumstances of the patient's home surroundings were terribly against recovery. The position of the enlarged glands, with reference to mortality, has also a bearing similar to that which has to attacks, as seen by the following table of some of the more important hospitals :—

Hospital.	Position of buboes in fatal cases.			
	Groin.	Axilla.	Neck.	No bubo.
Pilot Bunder ...	10	...	10	...
Jamsetjee Bunder ...	9	...	4	6
Police Hospital ...	9	2	1	4
Sahebs' Servants ...	41	9	5	7
Private Hospital No. 9 ...	20	8	7	...
Hindoo Hospital ...	125	57	13	...
Parel Hospital... ..	78	58	7	9
	212	134	47	28

The following are two authenticated cases of a recurrence of plague seen and attended by Dr. Godinho, L.M. & S., one of the Deputy Health Officers of the City.

Mrs. Ezra (Flora Benjamin), 1st attack at Hong Kong, on the 24th June 1894, Sunday.

(Previous to my getting ill, my ayah got the bubonic fever on the 21st or 22nd of June; she was removed by her relatives, and she died.) I got ill on the evening of the 24th (Sunday). I got fever accompanied with vomiting and severe pain in the head. Temperature 105. Dr. Jardine of Hong Kong saw me on the morning of the 25th (Monday). He prescribed for me a purgative powder and mixture. On the 26th, Tuesday, I felt better, and I could walk for about two or three hours, when I got bad again—this time with a severe chill, and temperature rose again. On this day Dr. Jardine saw me again and prescribed. He continued seeing me daily twice till the 29th, when I got very bad and had severe pain in the neck (left side). On Saturday, 30th, two consultants, Dr. Hastings and Dr. ——— came with Dr. Jardine, and they removed me forthwith to hospital (isolation). I do not remember now anything for about a week. The swelling in the neck was very painful. I could not move my neck. I was then operated upon in the neck (the scar is there). Six days afterwards Drs. Lowson, Morry, Newks, and Penny saw me at the hospital and operated on me again. From this date I gradually recovered, being regularly and kindly attended by the doctors till the 8th of August, when I left the hospital quite well.

2nd Attack.

On Sunday, the 6th December 1896, I had a severe pain in the head; this continued for two days, with slight fever and general pains. I took castor-oil. Bowels opened seven times. On Tuesday I got severe chills with vomiting and fever. Dr. L. Godinho saw me. Temperature 105; vomiting incessant. Linseed and mustard ordered to the stomach. The fever remained high all day. Quinine mixture given. On Wednesday I complained of pain in the right groin. Dr. Godinho examined me and found a glandular swelling there (femoral region). The gland could be felt—good sized marble. Dr. Godinho saw me twice on Wednesday. The fever continued 104 to 105. On Friday he saw me again, and changed mixture. The temperature now fell (Friday) to 103, and gradually went down until Sunday, when I felt nearly well, the swelling and pain getting less and disappearing. The lymphatics were painful.

Case No. 2.

30th September 1896.—Mahomed Allybux Kadirally (age 5?). Samuel Street, No. 197, second floor.

3rd day.—Left parotid bubo, size of a pigeon's egg, tender. Pulse 150; respiration 44; temperature 105. Shivering delirious (bubo, second day). 40 minims of medretine given and 10 minims of liq. hydrarg. perchl. every two hours. Calomel gr. ii stat. Ice to the head; two powders given.

* 31st October.—Restless; three motions. Temperature 103. Pulse uncountable. Respiration 56; bubo more painful and tender. Delirious. Medretine given, phenacetin and soda salicylate every two hours, as necessary.

1st November.—Pulse 180; respiration 44; temperature 103.5. Delirious; sleep disturbed; right lung congested. Had one motion. Had three powders and medretine given 24 hours. Mixtures, stimulants and expectorants.

2nd November.—Bubo enlarging and painful ; pulse 180 ; respiration 40 ; temperature 102·2. No headache ; lung clear ; had one motion. Treatment same.

3rd November.—Temperature 101 ; pulse 132 ; respiration 38. A little better. Medretine given every two hours and ext. carnis and rum every four hours.

4th November.—Temperature 102·2 ; pulse 144 ; respiration 40. Bubo subsiding ; right parotid gland appears tender ; medretine every four hours. Ext. carnis and rum every four hours.

6th November.—Temperature 100 ; pulse 140 ; respiration 40. Lungs a little congested.

8th November.—Temperature 99 ; pulse 128 ; respiration 36.

15th November.—No fever ; bubo suppurated ; pulse 112.

Recurrence.

2nd December.—Temperature 105 ; respiration 40 ; pulse 144. Very delirious and starting in bed. Left parotid gland much swollen and very tender. Liq. hyd. per m. xv. every two hours.

3rd December.—Temperature 104 ; pulse 160 ; respiration 60.

4th December.—Temperature 104 ; respiration 140 ; pulse 102. Delirium less.

5th December.—Temperature 100 ; respiration 40 ; pulse 100. Delirium less.

6th December.—Doing well.

N.B.—Allibux Kadratally, age 50 (same house) suffered from bubo 30th October 1896 ; died 3rd November 1896. Femoral bubo.

(Evidently a near relative [father ?] of the boy. From the name I infer him to be the father.)

Chapter IV.

LAND TRAFFIC INSPECTION.

(RAILWAY AND CAUSEWAYS).

Proposal to extend Railway inspection.

Almost as soon as the plague broke out in Bombay, the alarm spread all over India. In the first week of October, Calcutta telegraphed to enquire if the Railway traffic was being inspected, and, in spite of the belief of the authorities in Bombay that such an inspection would be of little use, (based on the notion that plague patients could not travel at all) the Municipal Commissioner considered it advisable to arrange a scheme of inspection, which was in working order before the end of the month. This was, however, entirely a Municipal affair confined to Municipal limits and under the direction of the Municipal Health Officer; but many plague patients succeeded in escaping, only to die in some distant place.

Finally on January 9th Government passed a Resolution calling the attention of the Municipal Commissioner to the fact that four plague deaths had taken place at Nasik between the 1st and 3rd of January, and two cases at Abu—one on December 4th and the other on December 11th. It may safely be said that many hundreds of similar cases must have escaped. There was no provision for inspecting the causeways, and so, if a sick man wished to leave Bombay, he had only to walk over the causeway and back from the station beyond Bandora. Even when detected, plague patients trying to leave Bombay by train were not sent to hospital, but simply escorted back to their houses again by a guard; there was nothing to prevent their walking out over the Causeways the same night.

On January 26th the Bombay Government, writing to the Government of India, while saying that provision had been made for the examination of passengers, observed that "the legality of the action taken is open to doubt, and as there is no legal provision for dealing with plague cases in areas outside Municipal limits, i.e., outside the Municipality, His Excellency the Governor proposed to extend section 434 of the Bombay Municipal Act to all areas whether Municipal or not."

In an Extraordinary Government Gazette dated February 11th, the following rules framed under the Epidemic Diseases Act were issued:—

1. Every train coming from the direction of Bombay to any of the stations to which these rules may be declared by Government to be applicable shall be stopped at such station and shall not be taken further

until the inspection provided by these rules has been carried out, and until the guard in charge of such train has obtained a certificate from the Chief Medical Officer in charge of the inspecting staff to the effect that all persons proceeding further by the said train, whether railway servants or passengers, are free from bubonic plague.

2. Every such train shall be emptied for inspection of the passengers in such manner as the Chief Medical Officer on duty may direct, and all such facilities shall be afforded by the servants of the Railway Company as the Chief Medical Officer on duty may consider to be necessary for the purpose of inspecting—

- (a) Persons who have come by such train, whether they intend to proceed by it or not, and
- (b) Persons who intend to start from any of the said stations and travel by such train.

In particular the doors of all railway carriages shall be locked at the station at which the train last stops before arrival at the station appointed for the inspection of passengers by these rules.

3. The Governor in Council may appoint any person or persons by name or by virtue of office to be the Inspecting Medical Officer or Officers for the purpose of these rules and may cancel any such appointment.

4. Inspecting Medical Officers appointed under these rules are empowered to examine all persons arriving by, or intending to leave by, the trains mentioned, and to detain persons suffering, or suspected by them to be suffering, from bubonic plague in such places as may be appointed for the accommodation of such persons respectively.

5. The Police shall act under the orders of the Chief Medical Officer on duty under these rules with regard to compelling persons to submit to such regulations as may be made or approved by the said officer for the purpose of inspection, and with regard to the detention and segregation of persons suffering, or suspected by them to be suffering, from bubonic plague.

6. Disobedience to any orders issued under the above rules Nos. 1, 2, 4 and 5 will subject the offender to a prosecution under section 188 of the Indian Penal Code.

The management of the inspection inaugurated by these rules was given to Surgeon-Major Street, D.S.O., I.M.S. Inward Traffic Inspection.

It was estimated that at the end of February no less than 377,866 persons had left Bombay. But with the fall in the death-rate, which showed signs of declining by the end of February, and probably also owing to the exhaustion of the scanty resources of the fugitives, the tide soon began to set the other way. The next urgent need was, therefore, to prevent the re-importation of the epidemic from the mofussil into the

B.I.S.N.	6,993
B.S.N.	123,447
G.I.P.	144,165
B.E. & C.I.	98,241
<hr/>	
377,866	

Causeways.

Early in February Dr. Britto called the attention of the Health Officer to the fact that two plague cases had been brought in over the Sion Causeway and urged the necessity for inspection. The Collector of Thana had been watching the further end of the Sion Causeway since the beginning of February to prevent the importation of the plague from the City, but no arrangements had been attempted on the Bombay side. This was, therefore, one of the first points to which the Committee directed their attention. The first suggestion was that the Commissioner of Police should be asked to make arrangements for stopping suspicious cases; he pointed out, however, that to put this important duty in the hands of the Police alone might lead to serious irregularities, and moreover suggested that it was impossible for a policeman to decide if any particular case of sickness was a plague case or not.

Surgeon-Major Kirtikar, who had already reported that many persons were entering Bombay by sea from Kalyan and Bhiwandi, proposed that all night traffic over the causeways should be stopped and the Sion Causeway watched. Finally on March 11th the Plague Committee decided that Surgeon-Captain Jennings, in charge of No. 10 District, should be given an increased staff and should be put in charge of this work, and both causeways were placed under his control.

There are five ways by which people can enter Bombay Island on foot:

1. The Bandra or Mahim Causeway.
2. The Coorla or Sion Causeway.
3. The G. I. P. Railway Causeway.
4. The B. B. and C. I. Railway Causeway.
5. A tract of land lying between Coorla on the mainland and the village of Sion on the Island of Bombay. This is sometimes flooded, but is generally fordable.
6. A small railway line running along a bund beside the Tansa main water pipe from Chimbur on the mainland to Sion.

These extend over a space of no less than five miles, and, as it would have been impossible to hold examinations at all these points without a very large staff, all the entrances were closed with the exception of 1 and 2. A police guard was posted to prevent the public crossing by the railway causeways on foot; the ford was watched by a military guard, who turned back all the people who tried to go by that way and made them go by the Sion Causeway; and the line over the water-main pipe was closed by keeping the swinging bridge always open.

The inspection actually began on March 24th. The Causeways were closed from 7 p.m. to 6 a.m. by a military guard to all except those who had obtained a special pass. On April 21st, 8 p.m. was fixed as the hour for closing the Causeways; and finally on June 6th, the Sion

Causeway was opened an hour earlier to suit the convenience of the market-gardeners who have to bring their produce to the Bombay market at an early hour.

On the Mahim Causeway the inspection was at first held on the Bombay side. Before the monsoon it was removed to the Bandora side. The staff consisted of two medical officers, assisted by the Mahim Sub-divisional officer, and nine police sepoy. As long as there was a hospital on the spot, the nurses used to do the work of examining the females. Since the hospital has been closed, Mrs. Saunders has been engaged for that work. Mahim.

• The examination of the Sion Causeway was held at the Sion end. The staff consisted of two medical officers, and two medical students. Since the abolition of the hospital there, a lady doctor, Mrs. Beale, has been engaged for the examination of females. Sion.

The number of cases detected was as under :—

			MAHIM.	SION.
Suspicious cases	...	...	36	16
Plague cases	...	...	13	11

The management of the two causeways was given to Surgeon-Captain Jennings, as the causeways were situated in his district.

The Railway Companies were first approached on the subject of railway traffic inspection and at once expressed their readiness to help the Committee in any way. The difficulty to be got over was how to examine 40 trains a day on each line without causing delay and obstruction of traffic. On the B. B. & C. I. line the greater numbers of the trains are for the local traffic between Bandora and Colaba; on the G. I. P., on the other hand, there is a great deal of through traffic, though there are many short-distance trains which do not go beyond Kalyan. To examine all the trains at one station was of course impossible without an enormous staff. Arrangements were accordingly made to separate the examination of the through traffic from the local. The former—that is to say, all trains coming from Jubbulpore, Nagpur, Poona, and Raichur were examined at Kalyan, and henceforth ceased to call at any of the intermediate stations between Kalyan and Bombay, except at Thana. The people who entrained at Thana were examined as they went on to the platform; thus the double examination of passengers was avoided; the local traffic was examined at Coorla. Railway In
spection.

A similar arrangement was made on the Bombay, Baroda & Central India Line; passengers by the Mail train were examined at Palghar; passengers by all other trains were examined at Santa Cruz; and local passengers entering trains at Santa Cruz and Bandora were inspected as they went on to the platform. The establishment of the system in the short time in which it was established would have been impossible without the hearty co-operation of the Railway Companies who from first to last met the Committee half-way in every proposal. B. B. & C. I.

First-class passengers were examined in their carriages as a rule ; second and third class carriages were emptied of their occupants, and the passengers were examined on the platform, while the carriages were searched by the police for concealed cases. Purdah women were not forced to get out of the carriage, or to submit to examination if they had any objection, but their names and addresses were taken.

Holders of season tickets and free passes were exempted from examination, and persons found suffering from plague who preferred to go their own caste hospital were allowed to do so ; arrangements were made to prevent their escaping on the way by the Medical Officer of the district.

When a suspicious case was found, it was removed to a shed for a more searching examination ; if the person was then found to be free from plague he was allowed to proceed by the next train, or sent to hospital if sick.

Until the guard of the train had received a certificate from the Chief Medical Officer at the station that the train was free from plague, he was not allowed to proceed.

The following are the details of the inspection at the different stations as reported by Surgeon-Captain Jennings :—

Kalyan.

The inspection began on the 12th February. When the inspection of inward traffic under the direction of the Plague Committee was started in the last week of April, an additional staff of one Medical Practitioner and two Assistant Surgeons were engaged. For the reception of passengers detained either for observation or treatment as plague cases, a camp hospital was constructed, containing two observation wards and seven plague wards. Other sheds accommodated the hospital assistant on duty, the stores and dispensary, servants, police, relations of the patients, and a kitchen. In all 740 persons were detained for observation ; of these, 172 proved to be cases of plague, 93 of which ended fatally, 79 recovered.

Palghar.

Inspection began on the 12th February. The staff consisted of one Commissioned Medical Officer, two Assistant-Surgeons, (one of these was added when inspection of inward traffic began) and six Hospital Assistants. There was a camp hospital consisting of one observation ward and six plague wards, with the usual quarters. Up to the 18th of April four mail trains were examined every day, and since that date five. Up to the 4th of July, 192 cases were detained for observation, of which 45 proved to be cases of plague, 24 of which died, 19 recovering and 2 remaining under treatment at the date of writing.

Coorla.

At Coorla 34 trains were examined daily. Inspection began on April 17th ; 126 cases were detained for observation, out of which number 34 were sent into hospital in Bombay as either plague cases or sufficiently suspicious to be treated as such. As they were sent to different hospitals, it is not known how many of these turned out to be genuine plague cases.

On the approach of the monsoon, the Coorla staff was transferred to Sion. Sion.
 Sion on June 5th, and a large shed erected on the platform for inspection purposes, and two Medical Practitioners were added to the staff, who also took part in the causeway inspection. Since the 5th June, 14 cases have been sent to hospital.

At Santa Cruz inspection began on April 17th, and 15 trains were Santa Cruz.
 examined daily, and 36 cases were detected and sent to the Khar hospital.

On June 5th, the Staff here was amalgamated with the barrier in- Bandora.
 spection of persons entraining at Bandora station. Fourteen cases have been sent into hospital since the 5th June. Patients were sent by train to Mahaluxmi Station for Arthur Road.

The barrier inspections, which were begun on April 16th to prevent Barrier In-
 the local plague cases entering the stations, are still, at the date of spection.
 writing, in force.

In all, this gives a total of 281 actual plague cases detected on the railway, and including the 34 cases sent to hospital from Coorla, most of which were presumably plague cases, 315. Since the beginning of June the whole arrangements have been under the management of Surgeon-Captain Jennings.

To receive any cases of plague which might be detected at any of Hospitals.
 the stations, temporary hospitals were constructed at Kalyan, Palghar, Thana, and Santa Cruz. Cases detected at Coorla, or at either of the causeways, were sent to the hospitals at Government House, Parel, and Mahim. Cases found at Bandora were taken to the hospital jointly erected there by the Bombay and Bandora Municipality.

The establishment engaged for the examination at the various Establishment,
 stations was as follows :—

KALYAN.
 3 Commissioned Medical Officers.
 1 Parsi Medical Practitioner.
 2 Assistant Surgeons.
 11 Hospital Assistants.

PALGHAR.
 1 Commissioned Medical Officer.
 2 Assistant Surgeons.
 6 Hospital Assistants.

SANTA CRUZ.
 2 Medical Officers.
 3 Assistant Surgeons.
 3 Hospital Assistants.
 3 Hospital Students.

BANDORA.
 3 Assistant Surgeons.

COORLA.
 2 Medical Officers.
 3 Assistant Surgeons.
 2 Hospital Assistants.

THANA.
 1 Medical Officer.
 1 Assistant Surgeon.
 2 Medical Students.

The Government Resolution legalising the examination of inward railway traffic was published on April 13th, and ran as follows :—

“The Bombay Plague Committee are hereby empowered to appoint Medical men as Plague Authorities at railway stations in the Thana District for the purposes of these rules. Such Plague Authorities shall have authority to inspect railway passengers, intending railway passengers, and other persons found in railway trains or at the railway stations to which these rules are or may hereafter be applied, and to detain and send to hospitals or other places appointed for the purpose persons found or believed to be suffering from the Plague. These rules are hereby made applicable to the railway stations of Kalyan, Thana, and Coorla on the G. I. P. Railway, and Palghar, Santa Cruz, and Bandora on the Bombay, Baroda & Central India Railway. The Medical Staff appointed by Government at the stations of Kalyan and Palghar for the purposes of the inspection referred to in Government Resolution No. 723—211-P, dated February 10th, 1897, shall be considered Plague Authorities for the purposes of these rules. On the Great Indian Peninsula Railway persons travelling by up through trains shall be medically examined at Kalyan, and no further medical inspection of such trains will be requisite ; but no passengers shall be allowed to enter such trains at any stations between the stations of Kalyan and Coorla, except at Thana. All local up-trains shall be emptied and their passengers medically inspected at Coorla, but no passengers shall be allowed to book from Coorla till they have been medically inspected. On the Bombay, Baroda & Central India Line up-trains starting from stations north of Bandora shall be stopped for medical inspection of their passengers at Santa Cruz, except in the case of the up-mail train, the passengers by which shall be inspected at Palghar. No persons shall be allowed to book at Bandora Station by up-trains until they have been medically inspected. Season ticket-holders and free pass-holders will ordinarily be excused from inspection, but the Plague Authorities may inspect them on any occasion on which they consider it advisable to do so. The Plague Authorities under these rules shall be placed under the immediate orders of Surgeon-Captain Jennings, I.M.S., who is authorized to make all the necessary arrangements and to commence inspection under these rules as soon as his arrangements are completed.”

Chapter V.

SEA TRAFFIC INSPECTION AND OBSERVATION CAMPS.

Outward.

The inspection of the outward sea traffic was started on the 6th February under the Government Resolution, General Department, No. 1975—1446-P, No. 624—130-P, of February 4th, and as soon as the Plague Committee entered on their work they took up the question of the inspection of the inward traffic. The plague had spread to many places along the coast, and it was certain that most of the people who had left Bombay would be forced to return shortly; and it was evident that the masses of mill hands who had fled to neighbouring districts like Ratnagiri, and whose relations could not support them long in idleness after their own savings were exhausted, would soon be returning home. There was no time to lose, therefore, if the City was to be protected against a fresh importation of the disease.

In addition to the people who had fled from Bombay, an influx of people, not inhabitants of the City, flying from the plague in their own villages, was to be anticipated. Many places were now suffering far more from the plague than Bombay, and partly on this account, and partly to escape the vigorous measures of the local authorities to stamp it out, people had begun to flock into the City from the districts most affected. Over this influx it was necessary to keep a careful watch. A typical instance was the case of the fishermen of Danda; here the plague had broken out with great violence, and Mr. Gilbert, the Chairman of the Bandora Municipality, removed all the people from the infected village to a segregation camp outside. As the ground in the camp became soiled by the number of people living on it, they were moved from spot to spot, and every effort was made to prevent the escape of plague-cases to other places. On this account, on the 23rd of March, about 400 persons left their village and proceeded to Bombay across the creek. Mr. Gilbert had of course no legal power to detain them, and all he could do was to warn the authorities in Bombay to be on the look-out for them; he also suggested that they should be induced, if possible, to return to their village, by warning them that their houses would be broken open in their absence for disinfection, if they did not return soon. As, however, it was easily ascertained where they were living in the various districts, a close watch was at once established over them, and it was not thought necessary or advisable by the Plague Committee to take any special steps to disturb them.

Arrangements.

The examination of the steamer traffic presented comparatively little difficulty, especially as Mr. Shepherd, who owns the line which

carries almost all the local passenger traffic, came forward with the most valuable help and advice. The steamers arrived at more or less fixed times, and the passengers landed at certain Bunders. The only difficulty in regard to their inspection, therefore, was the provision of the staff. This was done partly by the engagement of local medical practitioners and partly by the employment of medical students from the Grant and Ahmedabad Colleges.

The examination of the native craft presented many obstacles. **Native Craft.** Arriving at all times of the night and day, landing their passengers anywhere, and owned and sailed by men who were in full sympathy with those of their passengers who wish to evade inspection, special measures had to be adopted to prevent cases of plague being smuggled into Bombay by them.

In the earlier stages of the epidemic there was no record kept of the numbers of persons who came or went by these craft. But Mr. Shepherd estimated that over 8,000 people left Bombay by them in the month of January, and it is more than probable that, if a man had any suspicion about his health, he would prefer to go by a native vessel, where no questions would be asked to risking the chance of being rejected by one of the Steamer lines. The same would apply to the returning stream of people in the months of April and May. For Customs purposes there is at all times a regular patrol of the whole harbour from Middle Colaba as far as Sewri, and the officials of the Customs are always on the watch to prevent persons from landing in any but the regular places. The first step, therefore, was to ask the Collector of Customs to refuse to allow any one to land who had not obtained a pass certifying that he was free from plague. All native craft were ordered to bring up at one of the following anchorages :—

Tucker's Beacon.

Free anchorage.

Dutiable anchorage.

At each of these places there was a barge stationed with a Medical Staff, detailed from ten Medical Students placed on this duty. As soon as a craft came to anchor she was boarded, and the passengers examined by a Medical Officer, who gave a certificate of health if the result of his inspection was satisfactory.

This work was extremely arduous from the number of the boats and also from the fact that most of these boats carry vegetables, &c., for the Bombay Market. They arrive at about midnight, and if their men were not allowed to go ashore the first thing in the morning, great inconvenience would be felt by the whole city for want of fresh vegetables, &c. The work of inspection had, therefore, to be carried on mainly in the night, and great credit is due to the staff, who worked so cheerfully under these uncomfortable conditions.

The inspection of steamers was carried on at three bunders :—

Modi Bunder.

Victoria Dock Wall.

Prince's Dock Wall.

All these arrangements were carried out by Surgeon-Major MacCartie, the Health Officer of the Port, who had been in charge of the outward inspection from the month of February.

The pressure of work on the inward and outward staff was during all this time extremely heavy. The hours were frequently from 5-30 a.m. to 7 p.m. or 8 p.m., with only a short interval for breakfast. The special feature of the examination for the detection of the plague is the fact that the two most prominent symptoms of plague, viz., fever and buboes, are so extremely common among natives of this country that a very large number of persons had invariably to be set aside for a prolonged examination, as many as a dozen thermometers being in use at one time on occasions. Moreover, every possible effort was made, as might be expected, by the native passengers to avoid inspection. On one occasion two men were caught actually trying to squeeze their bodies through the railings on the Lakri Bunder, and were seized by a peon of the Customs and taken before a doctor. It was found *that both were in the last stage of plague*, and they were despatched at once to the Arthur Road Hospital. This was a parallel to the cases already mentioned in the land traffic portion of this report, and shows how erroneous was the general idea that it was only cases in the incubation stages which would have the strength or determination to travel.

The matter being an extremely urgent one, the inspection was actually begun under the orders of the Plague Committee on April 1st in anticipation of the publication of the rules framed by Government which were published on April 12th.

GOVERNMENT RESOLUTION, GENERAL DEPARTMENT.

No. 1975—1446-P, dated April 12th.

1. The Bombay Plague Committee is hereby authorised to appoint persons as Plague Authorities.

2. Such Plague Authorities are hereby empowered to medically inspect persons coming to Bombay Island by sea by vessels, including native craft, which have touched at any port in India between Bhatkal and a line ten miles north of Karachi, and to detain or send for detention to such hospitals or other places as may be appointed by the Bombay Plague Committee for the purpose any persons whom they find or suspect to be suffering from plague.

3. The master of every vessel, buggalow and every kind of native craft arriving at the Port of Bombay from, and having had communication with, any place on

•

It shall be the duty of the pilot or other officer to whom such report under Rule. 1 is made, to communicate the same without delay to the Health Officer of the Port.

6. The masters of vessels to which Rule 3 is applicable and the masters of all vessels arriving from the ports or places inside the limits prescribed in Rule 3 shall only permit the disembarkation of their crews and passengers between the hours of 6 a.m. and 6 p.m. and at such bunders or places as may be directed by the Health Officer of the Port.

The following is a copy of the certificate which had to be signed by the masters of vessels arriving at Bombay from ports other than those on the West Coast of India between Bhatal and a line ten miles north of Karachi :—

(Signed) _____ Medical Officer, if any. (Signed) _____ Captain.

The following Staff under Surgeon-Major F. F. MacCartie, I.M.S., Port Health Officer, was employed on the inspections :—

•

Surg.-Lieut. Evans, I.M.S.

Richards, L.M.S.

Bradley, Lady Doctor (worked up to May 18th).

Mr. Fernandez, Assistant Surgeon.

Mr. Wakeman

Mr. O'Leary

Mr. Abduln, Hospital Assistant.

B. Inward—

Surg.-Capt. Taylor, A.M.S.

Surg.-Lieut. Baines, I.M.S.

* „ Sealy, I.M.S.

Mrs. Van Ingen, Lady Doctor (worked up to end of April).

Mrs. Walker „

Mrs. Clemensha,

Dr. Munday, Private Practitioner.

Dr. Hormusji „

Mr. St. Romaine, Assistant Surgeon.

Mr. Croning „

Mr. Herring „

Mr. Cox „

Mr. Deeks „

Miss Foreira, Lady Student.

And the following 13 male Medical Students :—

Messrs. Spooner, Cooper, Quadros, Ghande, A. J. Dallas, D. P. Dallas, Sidore, E. Moses, Gadgil, Bhat, Naik, Pardhy, Kah, and Khandekar.

In addition to the above, Surgeon-Major MacCartie and Surgeon-Major Crimmin, V.C., and always one and sometimes two of the Surgeon-Lieutenants of the Outward Staff, had to be present and assist at the inspections.

The Lady Doctor, Miss DeCunha, on the Outward Staff, had also to lend assistance almost every day, the work being too heavy for the sanctioned Inward Staff.

**Treatment of
suspicious
cases.**

The procedure adopted in dealing with suspected cases varied according to the port from which they came. In the case of ports other than Cutch Mandvi and the Kolaba District, only those persons whose temperature was above normal were detained for observation; for this purpose observation sheds were established at Nariel Wadi, Reay Road, Wari Bunder, and in the shed on the Malet Bunder formerly used for the inspection of the Mecca pilgrims, which at this time was not in use, owing to the total prohibition of the pilgrim traffic by the Government of India.

Persons so detained, who had come from places only slightly, if at all, infected, were detained for a period of 24 to 48 hours and were then discharged if their temperature fell to normal.

Passengers from Kolaba, where the plague had been severe in parts, were all, whether their temperature was normal or not, kept under observation for five days; while passengers from Cutch Mandvi, where the plague had been more severe than in any other place were kept under observation for eight days.

Persons developing plague in camps of observation were sent to one of the Government Plague Hospitals. If they wished to be sent to one of their own caste hospitals, this was permitted; it having been

found, however, that some persons who had been sent to caste hospitals for observation on account of their having a suspiciously high temperature had been discharged before the proper time had elapsed, this concession had to be revoked in so far as observation cases were concerned. At first, difficulty was experienced in preventing persons sent to the observation wards escaping at night ; there were no walls or fences round the sheds, and the guard was not strong enough to patrol the whole circuit, while the general fear which all at first had of a Government Hospital prompted men to run great risks to escape. Subsequently, however, the fencing round these hospitals was increased, and guards strengthened, and every effort was made to reconcile the people to their short imprisonment. They were provided with the materials for preparing their own meals free, and other arrangements were made to meet their caste prejudices ; in some cases communities came forward with food, servants, &c., to meet the wants of their caste-fellows. These measures proved quite successful, and no trouble was experienced afterwards. Some idea of the magnitude of the task before the Inspecting Staff may be conveyed when it is mentioned that in the month of April the number of inward passengers inspected was 81,254 and including crews 106,272.

The number of persons inspected up to 21st June was 258,684, of whom about 5,000 passed through observation camps.

RESULT OF SEA-TRAFFIC INSPECTION.

Month.	No. of Persons Inspected.	Sent to Observation Camps.
April	106,272 *	447 (from April 13th)
May	123,812	3,047
June up to 21st...	33,205	1,341

Total number of plague cases detected by inward inspection from March 1st to June 30th = 57.

The Borah and Cutchi Memon hospitals reported that none of the cases sent to them turned out to be plague cases ; this cannot be considered as altogether satisfactory.

The ports from which the plague cases arrived were :—

				Brought forward...				39
Karachi ...	...	...	12	Jamnagar	...	...	...	1
Cutch Mandvi ...	...	...	11	Satara	...	...	...	1
Malwan ...	...	...	4	Vingorla	...	...	...	1
Devgad ...	...	...	3	Barowli	...	...	...	1
Rowadanda	...	...	2	Vizziadroog	...	...	...	1
Daramtha	...	...	2	Jaygad	...	...	...	1
Goa ...	...	...	2	Modi Bunder	...	...	...	3
Verawal ...	...	...	2	Harbour (exact port of departure unknown)	...	...	...	9
Bhawnagar	...	...	1					
Carried over...								Total... 57

The following are the details of the work done at the various observation camps :—

Nariel Wadi. Converted into an observation camp on April 25th ; in all 1,161 persons were sent here for detention, of whom 17 developed plague and were transferred to various hospitals.

Reay Road. Converted into an observation camp on May 7th, and received in all 664 patients. Seven of these developed plague.

Modikhana. Opened on 10th May. Number of patients received 1,227. Cases detected 7.

Malet Bunder. Opened on 5th June 1897. Number of cases received 1,370, of which two developed plague. This hospital is still open.

Wari Bunder. Was opened on 18th May 1897. Number of cases detained 1,371. One case of plague was discovered.

Most of the people arrived in an emaciated condition, and some, having come from famine districts, were detained mainly to improve their condition by feeding them up before they were allowed to go. Had they been admitted into the City in the state in which they arrived, they would have been highly susceptible to an attack of plague or cholera. Raw food was provided them ; they cooked for themselves and a marked improvement was noticed in their health after a few days. Every precaution was taken to meet their caste prejudices ; special servants were engaged for those who did not wish to cook their own food ; and special parts of the camp were set apart for some of the higher castes to suit their requirements in cook-rooms and latrines.

The diet allowed was as under :—

Class.	Rice.	Atta.	Ghee.	Salt.	Dal.	Veg- etable.	Sugar.	Tea.	Meat.	Milk.
	Lb.	Lb.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Pts.
Males (a)	1	$\frac{1}{2}$	2	$\frac{1}{2}$	4	6	1	$\frac{1}{2}$	1	...
Females (b)	1	$\frac{1}{2}$	2	$\frac{1}{2}$	4	6	1	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
Children over 8 (c)...	$\frac{1}{2}$	$\frac{1}{2}$	1	$\frac{1}{2}$	3	6	1	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
Children under 8.....	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	2	6	1	$\frac{1}{2}$	...	1

(a) Meat was given twice a week.

(b) If *atta* was preferred, then 1 lb. *atta* was given and $\frac{1}{2}$ lb. rice.

(c) Tinned milk of good brand.

Chapter VI.

Description of No. 10 District, typical of the Sanitary Work carried out in all charges under the Control of the Plague Committee.

No. 10 District, in charge of Surgeon-Captain Jennings, I.M.S., comprises the Northern half of the Island of Bombay, an extensive area, sparsely populated.

It is bounded on the north by the Mahim river ; on the south by Mahaluxmi, Byculla, Tarwari, and Mazagon ; on the east by the Bombay Harbour ; and on the west by the open sea.

The northern part of the district is made up of North Mahim, Dharavi, and North Sion ; the southern part of South Parel and South Worli Pakhadi ; the eastern part of Sion, Govari, Vadalla, Sewree, and North Parel ; the western part of North Worli Pakadi, Worli Koliwada, and Mahim ; while Dadar, Bhoiwada, and Matunga occupy the central part.

The population of the district is 98,402, or about $\frac{1}{2}$ of the total population of Bombay, and the number of houses is 9,612, or about $\frac{1}{2}$ of the total number of houses in Bombay.

In the scheme for combating the epidemic of plague, the district was divided into four sub-divisions, viz., Parel, Sion, Mahim and Worli. Each sub-division was provided with a complete organisation and establishment (as will be described in the course of this report) for the purpose of finding cases of the plague, removing them into a temporary Plague Hospital, and treating them there, providing accommodation for the relatives of the sick, disinfecting infected quarters, and attending generally to the sanitary condition of the sub-division.

Such organisation comprised, in a general way, the following :—

- (1) A temporary Plague Hospital (the size of which was regulated by the number of inhabitants) with quarters for the medical nursing and menial staffs, and also for segregating the relatives of patients.
- (2) A Sub-divisional Office.
- (3) A temporary barrack for a military detachment.
- (4) Conductors of Search Parties, such as Justices of the Peace, and other gentlemen who volunteered for the work of house-to-house visitation.
- (5) A sub-divisional staff ; comprising a sub-divisional medical officer, a clerk, medical subordinates, nurses, ward-orderlies, military and police sepoys for search work, Hospital servants, sanitary staff for disinfecting, workmen for building, demolishing, lime-washing and other purposes ; coolies for conveying ambulances ; an office peon ; and Police Ramoses for watch-work. (Details of establishment of each sub-division are appended to this report.)
- (6) Hand ambulances on bicycle-shaped wheels, with India-rubber tyres, and stretchers attached.
- (7) A locksmith, or bunches of keys, for opening up locked houses.

- (8) Pails, mops, engines, reels, hand-pumps, and all other appliances and tools necessary for disinfecting, building, demolishing, digging, burning, lime-washing, etc.
- (9) A stock of disinfectants, jars for holding solutions, and kettles for holding small quantities.
- (10) Complete hospital equipment according to a scale drawn up with reference to the size of hospital. (An example is appended.)
- (11) Arrangements for supplying hospitals with daily provisions, stores, ice, etc.
- (12) Arrangements for disposal of unclaimed dead bodies.
- (13) Arrangements for discharging patients on recovery in as aseptic condition as possible.
- (14) The provision of a bullock carriage, when necessary, for conveying the relatives of patients to the hospital segregation rooms.
- (15) Provision of leather shoes for all servants on plague hospital work who would otherwise be bare-footed.

An explanatory description of such points in the above headings as will illustrate more in detail the objects of the scheme will now be given.

(1) Hospitals were built according to a definite scale, and were classified according to the number of beds they contained. One with ten beds was called a Half-section Hospital, one with twenty a One-section Hospital, and so on; ten beds being always considered as a half-section.

Each hospital was provided with out-houses, which comprised quarters for nurses, medical subordinates, ward-orderlies, menials and sweepers.

The following out-houses were also provided for each hospital:—latrines, cook-rooms, segregation quarters for relatives of patients, and a mortuary.

Each hospital ward contained ten beds, and matting (movable) screens were constructed to place between each pair of cots.

The hospitals were built of bamboo posts and beams, matting walls on wooden frames, and jowli roofing with canvas ceiling. The cooking rooms were of corrugated iron construction with timber posts.

Water was laid on to each of the hospitals, and drawn from taps fixed on to stand-pipes.

The name of each hospital was printed in large type on signboards placed in conspicuous positions.

(2) The sub-divisional offices were in all cases as near as possible to the hospitals, and the sub-divisional clerks did their work in them; a description of which work is given under the proper heading.

(3) Temporary barracks were also situated near hospitals in order that the detachments occupying them might, in addition to their other duties, prove useful as a protection to hospitals in case of any disturbance.

(4) Conductors of Search Parties were all voluntary workers, and consisted of Justices of the Peace and other gentlemen. They were each provided with a suitable staff of Military Police and disinfectors, and had sections of sub-

divisions assigned to them ; and their duties were to search all houses in such sections as frequently as possible, and send all cases they found into the sub-divisional hospital and submit a daily return on a prescribed form to the District Medical Officer through the sub-divisional clerk.

Some of them worked singly, others in bodies, and periodically a large number would combine and visit some large locality.

The District Medical Officer and Sub-divisional Medical Officers accompanied them in turns, and there is a good reason to believe that most of the cases were discovered.

(5) *Sub-divisional Staff*.—Under this heading, the duties of the Sub-divisional Medical Officer and the sub-divisional clerk require more explanation than the remainder enumerated, whose designations sufficiently describe their duties.

The Sub-divisional Medical Officer, as a rule, was the visiting Medical Officer to the sub-divisional hospital. He held himself available each morning to assist Search Parties in diagnosing cases, and to issue detailed directions as to disinfection of infected quarters, destruction of suspicious articles, etc. He visited houses periodically in the sub-division to inspect them as to their fitness for human habitation, and as to the condition of their water-connections, making notes of his observations. He also made notes of all sanitary defects in the sub-division, and submitted a weekly report of such work to the District Medical Officer, who periodically inspected the sub-division with him, in order to see for himself such matters as required action.

The sub-divisional clerk was responsible for submitting all returns regularly ; for receiving and despatching reports of Conductors of Search Parties ; for keeping hospital accounts ; for preparing indents for disinfectants, stationery, and other requisites ; for keeping time of employes, and preparing the paysheets of all employes in the sub-division who were paid by the Plague Committee, and nominal rolls of all who worked in the scheme.

Of the rest included under the heading of sub-divisional staff, medical subordinates, nurses, ward-orderlies (military sepoys), Police Ramoses (watohmen), and hospital servants, all constituted the hospital staff and did the duties usually assigned to such appointments.

The military detachments were for the purpose of providing sepoys to accompany Conductors of Search Parties, and were located near the hospitals so as to constitute incidentally additional protection.

The sanitary staff was the usual Municipal sanitary staff of the district, placed at the disposal of the District Medical Officer, and augmented according to requirements.

The workmen were taken on temporarily and placed under an experienced inspector, who divided them into batches under sub-inspectors for each sub-division ; and their duties were lime-washing, erecting huts, demolishing insanitary structures, tile-turning and digging up of floors.

(6) The ambulances provided were most useful and much appreciated. They consist of iron frames upon which rest movable stretchers, and small curtained frames are attached for keeping the sun off patients' faces and heads. The wheels are constructed after the style of bicycle wheels with india-rubber tyres, so as to reduce jolting on being propelled by coolies. They have all been provided with monsoon frameworks and stout curtains.

(7) Locksmith's services, or bunches of keys, were necessary for effecting entrance into locked houses; more especially as cases were frequently found concealed in them. The houses were always opened and closed in the presence of policemen, whose duty it was, if there were articles of value, to take an inventory of them. Where locks had to be broken open, fresh locks were substituted.

(8) An adequate stock of pails, tubs, etc., was kept in the stores of the Central Office, and a certain number distributed therefrom to the staff of each sub-division, who could always obtain more by indenting on the Central Office.

(9) Disinfectants were kept in stock at the Central Office, and given out to the sub-divisional staffs, on indents. The disinfectants chiefly used were corrosive sublimate, carbolic acid, permanganate of potassium, sulphur, and tar.

(10) The equipment necessary for a one-section hospital is appended to this report.

(11) Arrangements for supplying the hospitals with daily provisions and for the messing of the nursing staff were made with a contractor.

Drugs were obtained from various chemists. Aërated waters were obtained from a local firm at a reduced rate. Arrangements were made for stimulants and ice as were most convenient for each hospital.

(12) Unclaimed Mahomedan bodies were buried, and those of Hindus burned. Biers were supplied to each hospital for conveying such bodies to the cemeteries or burning-ghâts.

(13) In order to reduce to a minimum any chance of infection, patients, when discharged from hospitals, were given a disinfectant bath and provided with a new suit of clothes either from among gifts to the hospitals, or purchased with money from charitable relief funds.

(14) In removing relatives of patients to segregation quarters in hospitals from infected quarters, where distances were great or other circumstances required it, arrangements existed for providing bullock carriages for their transit.

(15) Leather shoes were provided for all hospital servants, so that they would not have to walk bare-footed about the plague wards.

A general and explanatory description having thus been given of the organisation which was established for each sub-division, it would be well to state here that all the sub-divisions were controlled by the District Medical Officer, whose Head-quarters and Central Office were at Government House, Parel.

A brief sketch of the general work of the district with details of the staff of the Central Office, and a short report of each sub-division will now be given. First, however, a few precautions which were strictly observed in house-to-house visitation may be here enumerated.

Mahomedan houses were not visited on Fridays. Their purdah system was strictly respected, and only nurses or other ladies were allowed to examine their women. In burning rubbish, care was taken not to burn leaves of the Koran. Stimulants were taken for administering to weak persons before removal. Where it was appreciated, that rags which were burned meant warmth to the poor owners, they were compensated. Locked houses were opened in the presence of the police.

Brief Sketch of the General Work done in the District between 1st March and 30th June 1897.

Central Office Staff.

1 Head Clerk.	1 Police Sowar.
1 Storekeeper.	1 Peon.
1 Accountant.	2 Ramossees.
1 Assistant Clerk.	

Over 250 cases were found and sent into the three sub-divisional hospitals, while about the same number were found and sent to other hospitals.

Number of Houses	{	Reported unfit for human habitation ...	...	...	...	338
		Recommended for alterations ...	...	...	...	377
		In which water was cut off ...	...	...	...	65
		Recommended for repairs to taps ...	...	...	...	99
		Flushed and disinfected ...	...	...	...	1,421
		Lime-washed ...	...	...	...	1,285
		In which tiles were removed ...	...	...	...	2,657
		In which floors were dug up ...	...	...	...	1,159
		To which disinfectants were given ...	...	...	...	1,575
		Vacated (including groups of huts) ...	...	...	...	1,248
	{	Destroyed ...	...	...	...	188

For the period, including the last five weeks of the above-named period, the district has been free from plague.

A brief sketch of the work in each of the four sub-divisions will now follow :—

I. Parel Sub-Division.—This included Parel, Sewri, Bhoiwada, and Dadar.

Parel Staff.

1 Sub-Divisional Medical Officer.	2 Ramossees.
1 Sub-Divisional Clerk.	

Disinfecting, etc., Staff.

Plague Committee Staff—

1 Sub-Inspector.
1 Muccadum.
25 Men.

Municipal Sanitary Staff—

The Standing Staff of the District, augmented according to requirements.

Search Party Staff.

7 Conductors (voluntary workers).	14 Military Sepoys.
4 Sub-Inspectors.	6 Police Sepoys.

There was no sub-divisional hospital in this sub-division, as all cases were sent to Parel Government House Hospital. Dr. D. R. Wacha was the Sub-Divisional Medical Officer. The search party conductors were Sir George Cotton, Dr. Dias, Messrs. Vasanji Khimji, Batliwala, Marshal, Shaik Ahmed Esufbhoy, and Shroff. The wife of Mr. Shroff also frequently attended the visitation work for the purpose of examining women.

II. Sion Sub-Division.—This included Vadalla, Gonari, Matunga, Sion, and Eastern Dharavi.

Sion Staff.

1 Sub-Divisional Medical Officer.	1 Peon.
1 Sub-Divisional Clerk.	2 Ramossees.

Hospital Staff.

1 Hospital Assistant.	1 Ayah.
2 Nurses.	1 Dhobie.
4 Ward orderlies.	1 Bhistic.
2 Cooks.	6 Sweepers.

Disinfecting, etc., Staff.

Plague Committee Staff—	Municipal Sanitary Staff—
1 Sub-Inspector.	The Standing Staff of the District,
1 Muccadam.	augmented according to require-
25 Men.	ments.

Search Party Staff.

2 Conductors (voluntary workers).	12 Military Sepoys.
4 Sub-Inspectors.	8 Police Sepoys.

The Sub-Divisional Medical Officer was Assistant Surgeon Ross, who also had charge of the hospital.

The search-party conductors were Professor Muller and Mr. Beale. Nurse Gray sometimes accompanied the search-parties to examine females.

The two nurses were Nurse Gray and Nurse McGill from the Jamsetji Jijibhoy Hospital.

There were 67 admissions into the hospital—23 deaths and 44 recoveries.

III. Mahim Sub-Division.—This included Mahim, Parbadevi, and Western Dharavi.

Table of Staff.

1 Sub-Divisional Medical Officer.	2 Ramosces.
1 Sub-Divisional Clerk.	

Hospital Staff.

1 Medical Officer (voluntary worker).	8 Ward Orderlies.
2 Hospital Assistants.	3 Cooks.
1 Compounder.	1 Hospital Boy.
3 Sisters.	1 Dhobie.
4 Assistant Nurses.	7 Sweepers.

Disinfecting, etc., Staff.

Plague Committee Staff—	Municipal Sanitary Staff—
1 Sub-Inspector.	The Standing Staff of the District,
1 Muccadam.	augmented according to require-
25 Men.	ments.

Search Party Staff.

5 Conductors (voluntary workers).	16 Military Sepoys.
4 Sub-Inspectors.	4 Police Sepoys.

The Sub-Divisional Medical Officer was Dr. Dadibharjor. The Medical Officer in charge of the hospital was Dr. B. A. Oliveira, J.P., a voluntary worker. The Conductors of Search Parties were—Veterinary-Major Mills, Veterinary-Lieutenant Baldrey, Dr. D'Monte, the late Mr. J. H. Mody, and Mr. P. J. Modi.

The Sisters belonged to the Bandora Convent; three generally remaining at the hospital. They were Sisters Juliana, Edith, Hilda, and the late Sister Elizabeth.

There were 90 admissions into the hospital—42 deaths and 48 recoveries.

IV. Worli Sub-Division.—This included Worli Pakadi and Worli Koliwada.

Worli Staff.

1 Sub-Divisional Medical Officer.	1 Peon.
1 Sub-Divisional Clerk.	2 Ramosees.

Hospital Staff.

1 Hospital Assistant.	2 Cooks.
2 Nurses.	1 Dhobie.
4 Ward Orderlies.	3 Sweepers.

Disinfecting, etc., Staff.

Plague Committee Staff—

1 Sub-Inspector.
1 Muccadam.
25 Men.

Municipal Sanitary Staff—

The Standing Staff of the District, augmented according to requirements.

Search Party Staff.

3 Conductors (voluntary workers).	10 Military Sepoys.
4 Sub-Inspectors.	8 Police Sepoys.

Dr. Dareli was the Sub-Divisional Medical Officer, and also had charge of the Hospital.

There were no volunteers among the Justices of the Peace, but three leading men of the village who gave valuable assistance in finding cases were made Special Constables.

The nurses were Nurse Wheatley from England and Nurse Allnutt from the Cama Hospital.

There were 44 admissions into the hospital—21 deaths, 11 recoveries, and 12 transferred in a convalescent state.

Specimen List of Equipment for A-I Section Hospital.

The following list constitutes a convenient stock equipment to open A-I Section Hospital with. Many of the items are in excess of the equipment at first laid down, but experience has shown that at least the following stock is necessary:

I. Furniture, &c., required for Wards.—30 cots, 30 date mats, 30 spittoons, 30 blankets, 30 sheets, 30 pillow-cases, 30 towels, 30 dhoties, 30 saris, 20 loose coats, 20 loose pairs of drawers, 30 wraps, 30 pairs of socks, 30 pairs of slippers, 12 shigrees, 1 large boiler for water, 20 small bowls, 20 enamel plates, 10 feeding cups, 6 milk jugs (medium size), 10 knives, 10 forks, 24 pewter spoons, 4 earthen water-pots, 10 koojahs, 6 iron cooking pots, 1 frying pan, 4 zinc buckets, 1 firewood chopper, 1 kitchen knife, 2 tin kettles, 2 enamel kettles, 1 cupboard, 1 meatsafe, 2 hanging lamps, 2 hurricane lanterns, 2 gindystands (complete with enamel basis, &c.), 2 tables, 2 chairs, 1 time-piece, 1 folding screen, 30 bed head ticket frames, 30 temperature chart frames, 1 set dressing trays (zinc), 2 large disinfectant jars, 4 lotion bowls, 12 bed pans, 1 ice-box, and 6 pewter urinals.

II. Furniture, &c., for Nursing Staff.—1 dining table, 1 side table, 2 chairs, 2 easy chairs, 1 meatsafe, 1 box with lock and key for stores, 1 table lamp, 1 filter, 1 earthen water-pot, 2 koojahs, 2 dinner table cloths, 6 table napkins, 2 vegetable dishes, 1 pudding dish, 2 soup plates, 4 meat plates, 4 tum-

blers, 4 spoons, 2 knives, 2 forks, 1 tea-pot, 1 coffee-pot, 2 cups and saucers, 1 milk jug, 1 sugar basin, 1 butter pot, 1 kettle, 1 tray, 1 kitchen knife, 1 curry stone, 3 cooking pots, 2 beds teads (complete with beds, pillows, and curtains), 4 sheets, 2 counterpanes, 2 blankets, 1 dressing table with mirror, 1 cupboard or chest of drawers, 2 gindystands (complete with enamel basins, &c.), 2 towel racks, 12 towels, 1 zinc bath, 2 commodes, 2 chamber pots, 1 candlestick, 1 wall lamp, and 1 hurricane lantern.

III. Furniture, &c., for Medical Subordinate.—1 cot (bed and pillow), 1 gindy-stand (complete with enamel basin, &c.), 1 towel rack, 1 table, and 1 chair.

IV. Dispensary Furniture.—1 shelf or cupboard for drugs and appliances, 1 box with lock and key for poisons, 1 dispensing table, 1 writing table, 1 chair, 1 gindystand (complete with enamel basin, &c.), 1 towel rack, 3 towels, 1 tin kettle for disinfectants, and books and stationery as required.

V. Medical and Surgical Appliances—(a) Appliances.—1 small pocket dressing-case, 2 gum elastic catheters, 1 hypodermic syringe, 2 enema syringes, 2 2-ounce syringes, 3 sponges, 12 ice bladders, 2 ice bags, 2 waterproof sheets, 1 pestle and mortar, 1 glass rod, 1 roll of sticking plaster, 6 yards bandage cloth, 2 yards flannel, 12 cakes carbolic soap, 2 lbs. lint, 2 lbs. cotton wool, 10 lbs tow, 10 lbs. linseed, 1 spirit lamp, 6 test tubes, 1 urinometer, nitric acid 1 oz., liquor potassae 2 oz., Febling's solution 2 oz., 2 yards drainage tubing, 1 set scales and weights with spare set of grain weights, 30 dispensing bottles, $\frac{1}{2}$ gross corks, 20 draught glasses, 1 large pewter measure, 1 ounce and 1 minim glass measure, 1 slab, 2 spatulas, 6 large mixture bottles, 4 clinical thermometers, and 6 jars for disinfectants.

(b) Drugs.—

1 lb. Acid Borsic.
3 lbs. " Carbolic.
4 oz. " Gallic.
1 " " Hydrocyanic.
12 " " Sulphuric.
6 " Ammonia Bromid.
2 " " Carbonas.
2 lbs. Aqua Distillata.
1 drin. Argut Nitras.
4 oz. Bismuth Subnitras.
 $\frac{1}{2}$ " Caffeine Citras.
2 " Camphor.
 $\frac{1}{2}$ drin. Cocaine Hydrochloras.
 $\frac{1}{2}$ oz. Extract Belladonna.
2 " " Ergota Liquid.
2 " Tinct. Ferri Perchloridum.
 $\frac{1}{2}$ lb. Glycerine.
 $\frac{1}{2}$ " Gum Acacia.
 $\frac{1}{4}$ " Hydrarg Perchlor.
 $\frac{1}{2}$ " Hyd. Subchlor.
2 oz. Iodoform.
 $\frac{1}{2}$ lb. Linament Camphor.
4 oz. " Iodi.
2 " Liq. Arsenicalia.
1 lb. " Ammonia.
 $\frac{1}{2}$ oz. " Epispjatiens.
 $\frac{1}{2}$ " Oleum Anethi.
1 " " Menthapip.
2 " Potass. Citras.
2 " " Iodid.
1 " Pulv. Ipecac.
2 " Tinct. Digitalis.

1 oz. Pulv. Ipecac co.
2 " " Jalop co.
 $\frac{1}{2}$ " Santonine.
1 " Soda Bicarbonas.
1 " Tinct. Aconite.
2 " " Cardamom co.
2 " " Cinchona co.
2 " Hammamalis.
2 " Tinct. Hyociam.
4 " " Iodi.
4 " " Opii.
 $\frac{1}{2}$ lb. Ungt. Hydrarg.
1 " " Suceplax.
 $\frac{1}{2}$ " Vaseline.
 $\frac{1}{2}$ " Spt. Wine Methylated.
 $\frac{1}{2}$ " Zinc Oxide.
 $\frac{1}{2}$ " Soda Salicylas.
4 oz. Tinct. Nucis Vomica.
4 " Liq. Strychnia.
1 lb. " Hydrarg Perchlorid.
1 " Spt. Ammonia Aromat.
4 lbs. Magnesia Sulphatis.
1 lb. Spt. Aetheris Nitros.
2 oz. " Quinine sulphatus.
1 lb. Acid Nitric Hydrochlor Dil.
6 oz. Ammonia Chloride.
1 lb. Potass. Bicarbonas.
8 oz. Spt. Chloroform.
2 " Cerri Oxalat.
2 lbs. Linament Terabinthina.
1 oz. Phenacetin.

Chapter VII.

House-to-House Visitation and Disinfection.

On February 24th, His Excellency Lord Sandhurst called a public meeting of the Justices of the Peace, and invited them to meet him in the Town Hall ; this meeting was largely attended.

His Excellency in the course of his speech said, "I am most anxious for voluntary action, but, if action is not voluntary, the powers under the new Act will be used. I am now going to ask you to volunteer for active work in the City and really do active work. List of streets in the City have been made out, and I will indicate in what way those of you who volunteer can give effective service. Any medical men among you might volunteer your services for, at any rate, a part of the 24 hours for work in a hospital. Three medical men might work a hospital, arranging hours for relieving one another, but the line in which you, who are not medical men, might be most useful is, in going from house-to-house, searching for the sick, and getting them to hospital, and, if you are unable to get them to hospital, let the authorities know where they are ; thereby vastly increasing the usefulness of our house-to-house visitation."

The result of His Excellency's speech was, that a large number of Justices came forward at the end of the meeting and entered their names and addresses as volunteers ; and the principle underlying the detection of plague cases has been based on the utilisation of the voluntary services of these citizens, in visiting the houses of those belonging to their own sect or caste.

Previous to starting the work in each of the 10 districts, into which the City had been divided, the Committee invariably met the Justices in that district at some convenient place with the Medical Staff ; this enabled the Committee as well as the Medical Staff to become acquainted with, and gave an opportunity to the Justices to ask for information on points regarding which any explanation might be required.

At these meetings each Justice was given a sheet of instructions, which ran as follows :—

"The following suggestions in reference to house-to-house visitation and disinfection are drawn up for the information and guidance of District Medical Officers ; no hard-and-fast rules can in most instances be laid down for this work, and the Committee therefore depend in a great measure on the judgment, discretion, and tact of their District Medical Officers :—

1. It is proposed to employ, as far as possible, the Justices of the Peace who have volunteered their services ; each district will be divided into sub-divisions, and sub-divisions into sections for this duty.

2. The Justices will be asked to attend at the office of their sub-divisions at 7 a.m. on each day.
3. After the muster of the staff under each Justice, they will proceed to their sub-divisions with their staff for house-to-house visitation.
4. It is not expected that the Justices can personally visit every house daily, though it is hoped they will visit as many as possible, and it is presumed that they know their sub-divisions so well that information in regard to sick persons will be quickly obtained by them.
5. The staff allowed to each Justice will be organised according to the number of houses in the sub-division, but the minimum staff will be one sub-inspector or muccadam (native), one police sepoy, and four Military sepoys. Each Justice, on receiving intimation of, or on finding, a sick person, will make a note of the name of the place and the number or description of the premises, leaving a sepoy on guard to prevent the patient being removed until an ambulance can be obtained.
6. Each Justice, on having inspected the whole of his sub-division, will return to the office of the sub-division to fill in and hand over a report of his morning's work in a printed form provided for the purpose.
7. This procedure will be followed from day to day, and any Justice prevented from attending on any particular day is requested to send an early intimation to the Sub-divisional Medical Officer, who will delegate the work to some one else.
8. Sub-divisional Medical Officers, on receiving reports from Justices, will immediately arrange to send ambulances to the houses in which cases have been reported.
9. Before removal, cases should be visited by the Sub-Divisional Medical Officers or one of their qualified assistants, or, in the case of females, by a Lady Doctor, who will arrange for their removal.
10. The bullock carriage at each sub-division, should be utilized to convey the family of each patient to the segregation quarters at the hospital in which the patient has been placed.
11. In the removal of sick persons, the Sub-Divisional Medical Officer should, in the absence of the District Medical Officer of Health, personally supervise the procedure and submit a detailed report to the District Medical Officer of Health.
12. All commissariat and other arrangements for those people removed will be made by the District Medical Officer of Health, or such official, as he may appoint in each sub-division.

To each Justice of the Peace was given the powers of a Special Constable. This enabled him to legally enter houses for inspection work."

Meeting at 7 a.m. each morning at the nearest Sub-Divisional Office, each Justice was supplied with the following staff :—

- 1 Sub-Inspector belonging to the disinfecting staff.
- 3 Military Sepoys.
- 2 Polico Sepoys.
- 1 Locksmith.
- 1 Ambulance and Ambulance Sepoys.

The Justice after signing the book to notify his presence, proceeded to the locality selected for the morning's visitation.

If possible, he was accompanied by the Sub-Divisional Medical Officer of the District and, when the quarter was Mahomedan, by a Lady Doctor.

The houses in each street were systematically searched down one side and up the other ; no exceptions were made, all alike being subjected to the same rigid inspection.

On arriving at a house, sepoy's were stationed at all the entrances to prevent persons leaving before the inspection was completed ; the search party then entered the building.

Each room, landing, passage, loft, every nook and corner was thoroughly investigated ; owing to the exodus that had taken place from the City, a large number of rooms, dwelling-houses, shops and warehouses were found locked up, the owners having fled and left their property behind them. None of these places were overlooked. All were opened and examined in the presence of a Polico Sepoy, who saw that no unnecessary damage was done to property and that the premises were securely fastened after the search had been completed.

A considerable amount of ingenuity was exercised in the concealment of cases. Patients have been found hidden under bedding and under bundles of clothing, and friends have even gone so far as to lock their sick up in large wooden chests when the search-parties were expected, in the hope that they might thus elude their vigilance. A favourite device was for the patient to assume an air of great activity ; he would be found so busily engaged in his work that he had not time even to answer questions put to him. In the case of women, the sick were frequently come upon grinding corn and singing energetically, but the tell-tale, anxious, haggard face, and the suffused eyes would arouse suspicion, and upon examination the diagnosis was often confirmed by high temperature and enlarged glands.

On one occasion a Justice entering the house of a dhobi was told there were no sick on the premises ; this apparently was the case, the only people present being busily engaged in ironing clothes, and the

remaining available space being taken up with piles of clothes. Happening to notice what was apparently a movement among the clothes, the Justice further investigated the matter and found, to his surprise, that an old man (a dhobi) was concealed under the pile. On being removed and examined, he was found to be in an advanced state of plague.

On another occasion a search-party visited a room occupied by a whole family and found apparently nothing wrong; on the usual enquiries being made, all protested there had been no sickness in the place. The Justice when leaving observed a chair in the corner of the room covered with a cloth which had been thrown over it. On pulling the cloth aside, an old woman was disclosed huddled up between the legs of the chair, also in an advanced state of plague.

Other cases of concealment, such as persons being shut in boxes, in lofts, and in privies, were constantly being brought to light, and even corpses have been made to simulate life, to avoid the inevitable disinfection of the premises.

Whilst making these visitations every care was taken to respect the customs and caste prejudices of the different communities; before examining the house of a Mahomedan, the rule was to request the owner of the house to assemble the ladies of his family in a room apart, where the Lady Doctor could examine them while the other members of the party were carrying out their inspection of the premises. A like consideration was shown in regard to the religious prejudices and observances of all other castes and communities. This fact was soon generally recognised and appreciated by the people and, as a result, a cheerful and ready willingness to second the efforts of the searchers took the place of the passive resistance met with during the earlier days.

On finding a sick person—a suspicious case—the Medical Officer was called on to certify as to whether it was a case of plague or not; if diagnosed as plague, the ambulance was brought to the door of the house and the stretcher to the room of the sick person if the width of the doorway or the incline of the staircase permitted of this being done.

• The friends and relatives of the patient were then consulted as to the patient's wishes in regard to a hospital, and, if the person was a Caste Hindoo or Mahomedan, he or she was invariably sent to the hospital of the caste or sect.

The patient having been carefully placed on the ambulance stretcher, it was lifted on to the ambulance and the vehicle sent off to the hospital in charge of a military sepoy accompanied on some occasions by two police sowars when the removal took place from a crowded Mahomedan quarter.

This kind of inspection proceeded throughout the week.

At 10-30 or 11 a.m., the Justice and his party returned to the Sub-divisional Officer, and filled in the following certificate of the work done :—

Counterfoil.

DISTRICT No. _____

DISTRICT No. _____

HOUSE-TO-HOUSE-VISITATION CERTIFICATE.

I certify that I this day visited (or caused to be visited)

_____ houses in my District

_____ plague cases reported to _____

and discovered :—

on the _____ day of (No. of deaths) _____ deaths from Plague.

_____ 189 (No. of suffering cases)... _____ cases suffering from Plague.

Total cases... _____

by _____ J. P.

and that the same have been duly reported to _____

District Medical Officer of Health.

NOTE.—To be returned to the J. P. from the Dist. Med. Officer's Office after the accompanying certificate has been detached.

Signature of J. P. _____

The inspection again proceeded in the afternoon from 2 p.m. to 5 p.m.

Besides the large number of Justices who daily worked in house-to-house visitation, a number of gentlemen gave their services for the same work and were provided with Special Constable Certificates.

The work done by the above gentlemen was of the greatest value, and it is not too much to say that the house-to-house visitation could not have been successfully carried on without the important help they gave the Committee.

The following is a short account of a morning's house-to-house visitation in the Mahomedan quarter of the 2nd Nagpada District, which was personally conducted by the Committee assisted by Brigade-Surgeon-Lieutenant-Colonel Weir, the Chief Medical Officer of the Staff, on March 24th.

Late on the evening of the 23rd the Police Commissioner was asked to cord on early on the morning of the 24th the district bounded by Bellasis Road, Parel Road, Grant Road, and Duncan Road. This was done, and at 7 a.m. several companies from the 8th, 17th, 21st, and 22nd Regiments of the Bombay Light Infantry and a company of the Dublin Fusiliers were marched up and distributed at convenient points within the area above mentioned.

The Committee—

General Gatacre,
P. H. Snow, Esq.,
Surg.-Major Dimmock, and
C. C. James, Esq.—

assembled at 8 a.m. at Messrs. Treacher's Shop, where they were met by the Commissioner of Police, the Deputy Commissioner of Police, and Brigade-Surgeon-Lieutenant-Colonel Weir. The Lady Doctors present were—

Mrs. Peehey Phipson.	Miss Benson.
Mrs. Slater.	Miss Brennan.

Also—

Dr. Bernard, R.N.	Dr. Godinho.
Dr. Basset-Smith, R.N.	Dr. Pettigrew.
Dr. Sorabji Cawasji.	Dr. Kapadia.

The parties divided into two—the one under Brigade-Surgeon-Lieutenant-Colonel Weir, and the other under Mr. James.

Mr. James' party took Tank Street and Kazipura Street, Brigade-Surgeon-Lieutenant Colonel Weir's party took the east side of the Duncan Road as far as Kazipura Street. Many chawls in Tank Street were inspected and proved to be of the dirtiest character; among these was one occupied by several hundred Seedis (Negroes); in one of the rooms a Seedi aged about eighteen was found suffering from plague. After the doctors had certified to the disease, arrangements were made to fetch one of the new ambulances and, as there appeared to be considerable excitement among the Seedi men and women, to draft in some armed police and military sepoys. The Commissioner of Police and his Deputy, who were present, deemed it desirable that the King of the Seedis should be sent for to help to quell the excitement, which appeared to be growing. On his arrival, he did exceedingly good work in helping to remove the patient. It was evident that, without his help and without an armed force, it would have been impossible to remove this patient. The inspection of chawls then proceeded, but no other plague cases were found. The total work done by this party was one plague patient found and three suspicious cases.

A most careful inspection of each house in Duncan Road was made by Dr. Weir's party, who altogether examined 28 premises including very large chawls, some of which were occupied by over 300 people.

Two cases of plague, both Mahomedans, were found and removed in ambulances to the nearest hospital. It would have been impossible, unless supported as this party was, to have removed the patients; while Brigade-Surgeon-Lieutenant-Colonel Weir was posting the Police sepoys, large crowds collected in the streets, but they gradually drew back after the Military came up.

The new ambulances gave the greatest satisfaction, and the patients appeared pleased to be put into them. From one house a patient was removed with great difficulty through having to be carried down a staircase in a blanket. As each patient was removed, the place in which he lived was disinfected.

Some of the houses inspected were so dark inside that lamps were indispensable.

Disinfection.

As soon as a plague patient was removed the Disinfecting Inspector or his Sub-Inspector came on the scene with a supply of perchloride of mercury, hot lime and other disinfectants, with pumps, mops, brushes, buckets, tubs, &c.

All rags, bedding and clothes belonging to the patient, as well as articles likely to have been infected and of little value, were removed and immediately burned in the street; the disinfection then proceeded and was carried out as laid down in the following rules for the information of District Medical Officers :—

- (a) All rags, bedding, clothes, etc., belonging to persons affected, as well as all kutchra found in infected places; to be carefully removed and immediately burned.
- (b) The infected place shall then be washed down thoroughly with a solution of perchloride of mercury in the proportion of 4 oz. to 30 gals. of clean water in a wooden tub or bucket, a mop being used for all parts within reach, and a wooden hand-pump for all parts beyond reach. In the use of perchloride of mercury, it must be remembered that it is a virulent poison. In dissolving it, a little common salt should be used.
- (c) For the general treatment of the building, the measures hitherto adopted by the Health Department will continue as usual.
- (d) Sub-Divisional Medical Officers will see that this work is thoroughly done, as the checking of the spread of the disease depends upon it.
- (e) Immediately on the drying up of the disinfected place, lime-washing with quicklime laid on hot should proceed.
- (f) Re-occupation of places so treated not to be permitted without the sanction of the District Medical Officer.
- (g) Disinfect the moree, nahani, privies and traps, scraping such places as are likely to retain filth.
- (h) Open out the roofs so as to admit light and air thoroughly.

The above rules not being deemed sufficient, the Committee early in April considered it advisable to supplement them with a further and more complete set, a copy of which is given below :—

“The Committee have noticed on occasions, when house-to-house visitation has been proceeding, that sufficient care is not taken in regard to the disinfection of rooms and houses from which plague cases have

been removed. The Committee, therefore, lay down a few simple directions in regard to this matter.

1. Immediately a patient is removed from a room, the disinfecting staff should be ready and brought into operation.
2. All rags, bedding, clothing of the patient and kutchra generally should be carefully lifted up and removed and burned outside the building. In placing the articles outside, they should be carefully laid down so as not to raise dust.
3. No brushing of walls or floor should take place ; this is a most dangerous proceeding and is calculated to spread infection.
4. The first work in all instances is to flood the floor with a solution of perchloride of mercury not weaker than 1 in 1,000, the junctions of floor and walls and all corners should then be mopped with the solution, as well as the wall, as far as the mop will reach, and above this a small hand-pump should be used ; the floor, if made of earth, should then be dug up to a depth of 4 inches.
5. All furniture that can be dealt with should be likewise disinfected with perchloride of mercury solution, either with a pump, or with a cloth dipped in perchloride solution.
6. After the above work has been thoroughly done and the solution has dried, quicklime in a hot state, and in as strong a solution as possible, should be laid on all the walls, floor and ceiling.
7. In the event of the whole house requiring disinfection, the privies should be attended to first, not forgetting the shafts, then the staircases and corridors should be operated upon ; lastly the rooms in order, first by washing every part with perchloride of mercury solution and laying on the quicklime as described in paras. Nos. 4 and 6.
8. All nahanis and nahani pipes should be carefully disinfected by flooding them with perchloride of mercury solution, and, when necessary, they should be altogether removed and replaced with new ones at the cost of the owner of the premises."

In the case of the poor, a small money grant was made them as compensation for articles destroyed. Property, the destruction of which would inflict great loss on the owners, was moved out into the road and left there exposed to the sun and air for three days, a guard being placed over it. The contents of shops and godowns in which cases of plague occurred were treated in a similar manner.

Besides the actual disinfection and limewashing of the inside of the houses affected with plague, a steam flushing engine was obtained and the outside of the premises were thoroughly washed down,

and the gullies and drains and nahani traps well flushed with disinfectants. Where 4 or more cases had occurred in one house, the place was vacated and was not re-occupied until the District Medical Officer was satisfied that it was free from infection. Where the house was in such an unsatisfactory sanitary condition as to be unfit for human habitation it was vacated, condemned by a Sanitary Board and marked with the letters U. H. H.* Huts for accommodation of people who were thus turned out of their houses had already been erected in different quarters of the City by the Municipality.

Thus, not only were plague cases discovered by means of house-to-house visitation, and the infection of the disease controlled and prevented from spreading, but the dark, evil-smelling, ill-ventilated, ill-drained, over-crowded lanes and alleys of Bombay were explored and thoroughly cleansed.

The above describes the disinfection of merely individual dwellings or rooms, but beyond this large disinfecting operations were undertaken in whole localities both before or after the Committee was appointed. At one time not less than 5,000 extra coolies were engaged on this work alone. In Kamatipura a special gang of some 400 coolies worked on lime-washing and other cleansing works throughout part of December 1896 and the whole of January. Every house was lime-washed to the number of 1,344, and something over 100 tons of fresh hot lime were expended on the work. Dropping plague cases had been occurring in Kamatipura since the end of September, but it was not until the latter end of November that they became indigenous, and during this period the Health Department had been giving the district a thorough cleansing. Plan No. 8 is a chart shewing on a scale of 10 days to one inch and 10 deaths to one inch the deaths that occurred in the district on each day. From that chart it will be seen that until November cases were probably imported from other parts of the City and were not indigenous, and if Plan No. 2 is referred to, it will be noticed that Kamatipura was epidemic in October, agreeing with Plan No. 8.

Group Nos. 1 and 2 are considered indigenous, while group No. 3 is considered to be epidemic.

During December and January the population of the district fell to one-half.

The disinfecting operations were completed about the 10th of February, after which date it will be seen that plague practically left the district, and though cases occurred, it is clear that the disinfecting operations brought about much good. Kamatipura is by virtue of its low-lying position naturally unhealthy, and its houses are mostly dark, damp and without ventilation, and most of them have been built on reclaimed ground, a more suitable place for the growth and spread of disease could hardly be found.

* Unfit for human habitation.

In Daji Purbhoo's Wadi at Gharupdeo in Tarwari, there are some 90 houses containing a population of some 2,000 persons. The houses are mostly (a wretched class of chawls) of kutchra construction, dark, damp, with deficient ventilation and the surroundings very insanitary.

Most of the sewage of the place soaks into the ground. The first recorded cases occurred on January 1st, the 2nd on the 6th, and from that date onwards until the 14th February, 21 cases occurred; by that date all the inhabitants had left the Wadi. The usual cleansing operations were carried out, all the houses being mostly thoroughly lime-washed, and those in which cases had occurred, treated with perchloride of mercury. The water was cut off in all the dwellings and stand-pipes with taps erected from which open drains were constructed, and all kutchra collected and burned.

The cleansing operations commenced on January 28th and occupied two days and were most thoroughly done.

After the 29th of January the following cases occurred: 30th, 1 case; 31st, 2; Feb. 2nd, 2; 3rd, 3; 4th, 1; 5th, 1; 7th, 1; 9th, 1; 10th, 1; 12th, 2; 13th, 3; 14th, 1.

This would appear to point out the fact that when the surroundings are hopelessly insanitary and where buildings are overcrowded as they were in this Wadi, and have little or no plinth, and the rooms contain no means of ventilation, except the door, sanitary operations have little or no effect in stopping the disease, and that the only certain treatment is segregation of the people and demolition of the buildings.

In Amba Wadi which is in the Mazagon District, there are about 200 houses containing a probable population of 1,800. The houses are many of them pucca built, rooms fairly dry, and light with ventilation. The first case of the disease here occurred as in Daji Purbhoo's Wadi on January 1st, another case was not reported until January 13th and then 4 are reported: 13th 1, 14th 1, 15th 2. There was then an interval of 10 days, the next case occurring on the 28th and 2 on the 29th.

On January 21st disinfecting operations commenced and were completed on February 4th, from that date practically no cases occurred although many houses remained occupied.

It is interesting to note in regard to the above three districts that the virulence of the disease did not seem to be affected, as might naturally be supposed, by the sanitary character of the houses or neighbourhood, but it will be observed that in districts where the houses were fairly sanitary and free from excessive overcrowding, cleansing operations showed distinctly beneficial results, while in the districts where the houses were abnormally insanitary and overcrowded, similar efforts were rewarded with little success.

In connection with the above it may be interesting to note the density of population in a few districts in the City :—

District.			Area in Acres.	Population.	Density per Acre.
Kamatipura	...	...	66	29,208	441.5
Dhobi Talao	...	...	97	29,945	407.7
Kumbar Wada	...	...	46	32,209	699.3
Khara Talao	...	...	41	27,033	649.3
Bhuleshwar	...	...	75	38,361	506

in all of which districts plague raged with more or less virulence at various times. In comparing this with the City of London it may be mentioned that the greatest density of that town is probably not more than 222 persons per acre.

Plans Nos. 11 and 11a show the progress of the disease in Worli Koliwada. The events which accompanied the course of the disease in this village are exceedingly interesting. Worli Koliwada is an isolated village on a peninsula in the north of the Island ; it is inhabited almost entirely by Kolis (fishermen). The number of houses in the village is 936, and the normal population is 5,493. The character of the disease was marked by extraordinary virulence, over 90 per cent. of the persons attacked dying, often after a few hours' illness only.

The houses are mostly kutcha-built with cadjan roofs, which are in many cases brought down so low as to render the inside very dark. The streets are exceedingly narrow. There is no artificial drainage, but good natural drainage exists from west to east ; the whole village is open to the sea-breeze on two sides. During the months of October and November 1896 there is no record of any case of plague having been present in the village ; the first case being reported on December 1st.

The villagers were fully alive to the dangers of the disease and of its getting into the village, and they took extraordinary precautions. The three patels, headmen of the village, agreed among themselves as far back as October to prevent strangers entering the village, by placing watchmen at the entrances, and to allow no persons to proceed from the village to any affected part of Bombay ; they even went so far as to object to the usual Municipal coolies visiting the village for cleansing purposes. But all this was of no avail, as a Koli (named Roza Maria Creado), resident of the village, died on December 1st. No further deaths occurred till December 11th.

Plan No. 11 is on a horizontal scale of four days to one inch and a vertical scale of four deaths to one inch.

It will be seen that the deaths have been grouped Nos. 1, 2, & 3.

On plan No. 11a the deaths have been shown in the houses in which they occurred by circles colored in the respective colors of the groups (either 1, 2 or 3) which they represent.

Group No. 1, which contains only one case, is shown by a red circle on house No. 6, in which the woman lived and died.

Group No. 2 contains four persons; they are shown on their respective houses by yellow circles.

Group No. 3.—All the persons in this group are shown by green circles encircling red spots.

By grouping the disease as on plan No. 11 and plotting on No. 11a the cases in their individual houses, it has been sought to throw some light on the way in which the disease spreads.

There is no doubt that the village of Worli was at the time of the outbreak of plague in a fit state to receive and propagate the germs of the disease on account of the drainage of generations having soaked into the ground on which the village stands, combined with the continual wastage of an ample water-supply.

No. 1 case, as shown on the plan, died in house No. 6 on 1st December. There does not appear to be any connection between No. 1 case and the first death in No. 2 group which occurred on the 11th December, but it is probable that No. 1 case in some way spread the infection to some one in group No. 3, who lived in his vicinity, by some means other than personal. In glancing at No. 2 group, it will be seen in house No. 535 that two members of the group died and that two of group No. 3 were affected and died in the same house, which points to the strong probability of personal infection. In house No. 534, too, three deaths occurred of neighbours who lived in close proximity to three members of No. 2 group. In glancing further at plan No. 11a, it will be seen that in almost all cases the disease forms itself into groups. But the chief characteristic of the disease in this village was its virulence and the extraordinary short period in which it became epidemic. Usually several warnings take place. First, sporadic imported cases exist perhaps for a month, then a few indigenous cases occur and there is a small outbreak, and then comes a lull in the disease, but in this instance it was not so. Group No. 1 was an indigenous case and the first in the village so far as is known. Group No. 2 consisted also of indigenous cases; and then group No. 3 commenced with three cases on December 18th, after which the whole village quickly became affected.

As regards the disinfecting operations: on 20th of January a gang of 270 coolies were sent to the village; they disinfected all affected tenements; limewashed all houses and removed all roofs in the village; cutchra was burnt; the water was cut off from the houses, and standpipes with drainage to the foreshore substituted, the whole work being completed as shown on Plan No. 11a on the 29th of January. By this date, with the exception of some 176 of the inhabitants, all had left the village. Many went to live in surrounding fishing villages, only it is feared to infect them. Some 250 went by road to the Karli Caves at Lanowli,

where several cases of mild type took place after they had arrived, and all recovered. Some 400 encamped near Worli village. Among these no fresh cases occurred after the ten days' incubation period, although these persons daily went to the village to get grain which was stored in the village granaries. During the epidemic 139 cases occurred in the village, nearly all of which proved fatal. On re-occupation of the village in March, no further indigenous cases occurred. It will be seen here that the course of the disease was most distinctly south to north. From enquiries made in the village, it has not been possible to ascertain that the advent of the disease was marked by any great mortality among rats, such as is almost invariably the case.

Plans Nos. 12 and 12a are, respectively, a chart shewing the deaths which took place in the village of Sewree Koliwada, and a site plan of the village itself.

The progress of the disease in this place has considerable interest attaching to it.

Sewree Koliwada is a village in the north-east of the Island, containing a population of some 600 Kories (fishermen) inhabiting about 150 houses.

The first case reported in the village occurred on the 12th of December, but it was not until January that the disease became epidemic. The disease here, as in Worli, was marked with great virulence, nearly every case being fatal.

Disinfecting operations were carried on all through December and January in individual affected houses, but had little or no effect on the spread of the disease. On the 27th of January these operations were extended, and some 200 coolies were placed on the work; they disinfected and lime-washed all and every house; rags and kutchra were burned; all roofs were opened for ventilation; and the place generally had a thorough cleansing. This work lasted five days, and the spread of the disease was checked. But, at the back of the village, there was in December and January a long and narrow shallow pool of water. This pool was daily largely used by the male population of the village for ablutionary purposes in connection with defecation. Professor Hankin in his researches at this village about the 24th January discovered the plague bacilli in large numbers in this water. Upon this being known, the pool was thoroughly disinfected with carbolic acid on or about the 27th January, and the whole field, which was littered with human excrement, was cleaned up. It is possible that in this incident lies the crux of the situation. Disinfecting operations apparently up to January 27th had very little effect on the spread of the disease, and it may be conjectured that its spread was fostered and maintained by the daily use of the water in the pool, especially when we know that most of those affected were males.

The incident, however, is of interest, as from the 27th January little or no disease occurred in this village, which, although considerably reduced in numbers, was not altogether depopulated, there being never less than 350 people in the place.

Plans Nos. 12 and 12a are dealt with in a similar manner to Plans Nos. 11 and 11a, the deaths being grouped Nos. 1, 2 and 3, as shewn on their respective colours and houses on Plan No. 12a.

With regard to the distribution of the disease, as shewn in Plan No. 12a, attention may be drawn to the fact that here the disease has not formed itself into groups, as is almost always the case, and as especially noticed in Plan No. 11a, but is almost evenly distributed over the village, there being rarely more than one case in a house.

This, then, points apparently to an unusual element in the spread of the disease, *viz.*, the use of the water mentioned above.

In all 52 cases occurred in Sewree between December 12th and January 27th, mostly fatal.

There are no drains of any kind in the village.

Plans Nos. 13 and 13a are of the village of Parel, and are similarly dealt with as in the previous two sets of plans.

It will be noticed in Plan No. 13 that up to January 10th two cases are recorded as having occurred ; these were probably imported.

Group No. 1 on Plan No. 13a gives two indigenous cases. Group No. 2, 9 ; and Group No. 3, the epidemic period, 45.

There are 589 houses in Parel village, and many of them well built and upper-storied.

The village has been drained, but no connections have been made between the sewers and the houses, and the sewage either flows down on the surface of the narrow lanes or soaks into the soil. This village is in an almost hopelessly insanitary condition, and has been a hot bed of fever for many years.

On the 6th of February a large gang of some 350 coolies were set to work to thoroughly disinfect and cleanse the village. The whole of the village was dealt with by the evening of the 11th, but, as will be seen by Plan No. 13, this had little or no effect, the disease being marked with greater virulence after February 11th than before, and continuing more or less throughout March to be severe.

Plan No. 13a shews the deaths only as far as March 8th. It will be noticed from this plan how many evidences of personal infection there appear to have been.

No. 1 in Group 1 lived in house No. 1369, one of the earlier of Group No. 2 lived in the adjoining house No. 1370, and a member of Group 3 lived in the same house, thus giving a sequence of infection.

No. 2 of Group 1 lived and died in house No. 1290, a member of Group 3 did the same ; here there was no possibility of personal infection, as the usual days of incubation were exceeded. But in other instances in the plan this probability is pointed to very strongly. House No. 1338 contained three of the members of Group 2. House No. 1243 contained five members of Group 3, possibly nearly the whole family, and several others contain two or three. But Plan No. 13 chiefly points to the absence of good results from disinfecting measures.

Parel is a village in which a number of the houses are very good, and are well ventilated ; on the other hand there are many overcrowded hovels of the most insanitary class, situated on sewage-sodden soil and abutting on narrow lanes ; it was in these houses that the disease chiefly raged.

Plans Nos. 14 and 14a are plans of a Koliwada (fishing village) adjoining Moree Road in the District of Mahim. In this village the advent of the disease was exceedingly sudden. Previous to the 20th of January only three cases are recorded, but on the 20th, 21st, and 23rd, three further cases occurred, and from then almost immediately the whole village became epidemic.

Like all Koli villages the houses here were of kutchha construction, with cadjan roofs brought down as low as possible to the verandahs, and so effectually stopping light and ventilation ; there was likewise a total absence of drainage.

On the 19th of February a gang of some 300 disinfecting coolies was sent to the village to supplement the disinfection of individual infected houses which was already in progress. These coolies completed their work on the 26th of February. The roofs were stripped from all the houses, and in many instances burnt, all the houses were disinfected and limewashed, and the disease was effectually stamped out.

Plan No. 14a teaches the same lesson as the previous plans, *viz.*, that the disease attacking several members of the same family or household points to a strong probability of personal infection.

It will be seen that two members of Group 1 lived and died in house No. 517, as did also two members of Group 2, and in the rest of the village almost every family affected lost two or more members.

Chapter VIII.

Report by Veterinary-Major J. Mills, A.V.D., 1st Class Magistrate in Plague Charge, Bandora Slaughter- House.

Although plague had existed in Bombay in a severe form since September and at Bandora since the beginning of November 1896, strange to say no cases took place amongst the inhabitants of the slaughter-house compound until the 14th February 1897, when a municipal peon, who had served faithfully for 16 years, was struck down with the disease and succumbed to it on the 16th. This may be due to the fact that the sanitary arrangements of the place are under strict European supervision, and that there was not much intercommunication between the employes and people living in the infected areas. No cases took place for a week after this. It then broke out in an epidemic form, got a firm hold and spread rapidly till it reached its climax on the 15th March, when four deaths and three cases took place. After this it steadily declined and died out in 66 days from its inception.

By order of the Chairman of the Plague Committee I assumed charge of the slaughter-house and the quarters inhabited by butchers and others in Bandora on the 12th March 1897. Previous to this, 9 cases had taken place, 5 of which had died. Two through fear of being taken to hospital were lying in a shed in the compound of the mosque just outside the gate of the slaughter-houses, and one was in a room of a temporary chawl built for segregation purposes. The rumour that the two cases mentioned above had been taken into the mosque itself was without foundation. In their panic their relations had taken them where they thought they would get protection and be under the care of their own Mullah. Having no hospital ready, I made the shed they were in, which was well isolated, as comfortable as possible, and gave them every care in my power, but death claimed them both the day after I assumed charge and within 48 hours of their being attacked.

From the onset I could plainly see that the task undertaken by me was by no means an easy one. The majority of the people I had to deal with were fanatical Mahomedans, and only about 50 out of 700 of them were Hindus. Both sects, however, were equally opposed to the removal of their sick to the hospital, to treatment, and to segregation. I, however, at once had a long interview with the heads of both communities and got them to agree to the following terms :—

- (a) Their huts to be evacuated as soon as new temporary ones were erected for them.
- (b) A hospital to be built at a convenient distance from the slaughter-houses to which they would remove their sick, and to be allowed to adopt their own modes of treatment by Hakims if they so wished, or to employ the services of the Medical Officer detailed for duty at the slaughter-houses.
- (c) They agreed to the segregation of those who had been in contact with the sick.

These terms were adhered to with only one slight exception, where a Mahomedan bullock cart-driver, whose wife was suffering from the plague, said that sooner than allow her to be removed to hospital, he would cut his wife's throat and his own: and probably he would have attempted the same with me had Police not been at hand. The Hindu bigaries gave, in the first instance, a considerable amount of trouble. A man was attacked with the plague on the 17th March, and immediately placed in a segregation hut, as the hospital was not ready, but he was forcibly removed by his relations and others to his own house. On the morning of the 18th he was again placed in the segregation hut, while the other bigaries were in Bombay with the meat-vans, but on their return they immediately carried him home again. The bigaries were at once paraded and remonstrated with, but it was quite evident they had no intention of yielding and that there were two ringleaders who were urging them on to open defiance. They went the length of laying down their coats and whips, and refused to drive the meat-vans to Bombay, if they were not allowed to do as they pleased with their sick. Matters looked so serious that I at once communicated with the Deputy Commissioner of the Municipality, Mr. DuBoulay, who immediately came to Bandora and made preparations for any emergency. Drivers were procured from the Commissariat Department and held in readiness at the railway station. Arrangements were made both with the Bombay and Bandora Police in case of a disturbance, and at 10 p.m. the following gentlemen assembled at the slaughter-houses to await the issue of events:—Mr. DuBoulay, Dr. D'Monte, medical officer in charge; Mr. Dubois, District Superintendent of Police, Thana; Captain Clowes, Chief Commissariat Officer; Inspector Hack, Bombay Police; and myself. The bigaries were again interviewed but were still defiant, and they had under the cover of darkness again removed the sick man to the village on the right of the railway line. We proceeded there in a body and with the aid of the police had him brought back to the segregation hut, and a guard placed over him. The ringleaders were brought before Mr. DuBoulay, the Deputy Commissioner, dismissed on the spot, and removed with their families under an escort across the causeway to the Bombay side. These prompt measures had a most wonderful effect. The drivers at once resumed work and the meat was seen safely off to Bombay, but, in case of any disturbance on the road, it was deemed advisable to place the vans in charge of the police. Here all further trouble was at an end, and from this date the plague operations worked smoothly and well. In fact, instead of the people obstructing me, they gave every assistance.

The most urgent requirements that faced me were the erection of temporary huts, so as to get the people at once away from the seat of infection; the building of a hospital and its accessories, and the disinfection of the houses and drains. Before I assumed charge, a temporary chawl containing 10 rooms was built by the Municipality in an isolated part of the compound. This chawl, however, very soon acquired an unenviable reputation, as four cases of plague took place in it shortly after it was occupied, and all proved fatal; many were the bitter imprecations hurled at this tenement as the people left it *en masse*. No earthly power would persuade them to return, as they said an evil spirit dwelt therein and that it was a house of witchcraft and nothing would satisfy them until it was razed to the ground. With commendable promptitude the Municipality, in a little over a week, had 9 chawls erected, containing 64 rooms for the Mahomedans to move into and 2 chawls containing 10 rooms each for Hindus. There was a slight delay in getting the hospital up, as the site selected was on a piece of a land on the Bandora side of the causeway, and the permission of that Municipality had to be obtained to be allowed to build thereon, besides an encampment of Native Christians was there, and they were unwilling to move unless they received some compensation. This was arranged, when building operations were at once commenced. The hospital

consisted of one Mahomedan ward, cook-house, mortuary and latrine, one Hindu ward, cook-house, mortuary and latrine, and one police chowky. To facilitate work, the slaughter-houses were placed on the telephone system of Bombay. Water was laid on at the chawls and hospital by means of standpipes.

I soon learnt it was quite evident, that, if we wanted our own way in all things in dealing with the Mahomedans, it would be necessary to enlist the services of their Mullah and to take him into our confidence, I accordingly installed him as Superintendent with the following staff under him :—

1 Mahomedan Ward Boy.	4 Ramosees.
1 Mahomedan Ward Woman.	3 Bigaries.
4 Sweepers.	

A clerk was also employed. The Superintendent of Police, Thana, kindly placed 4 sepoys at my disposal for hospital duty.

The first step adopted to check the progress of the plague was the application of scientific sanitary measures. Mr. Leask, the Acting Health Officer, sent me an Inspector, who fumigated the rooms, disinfected the drains, and instructed the bigaries and sweepers in their work. To prevent dampness, the cattle water-troughs, which were close to the chawls, were removed and placed in a remote corner of the compound. An extra latrine was erected; and all the people warned that punishment would follow, should they defecate elsewhere. An extra night-soil cart was employed. Between every three rooms was placed a receptacle for the sweepings of the floors, dirty water, and filth in general. These receptacles were kept thoroughly disinfected with chloride of lime, and their contents removed morning and evening. All the sweepings of the compound were burnt. The sanitary state of the cart outside the slaughter-houses was very bad indeed. There were two wells in the cart, which were in a most foul state and seemed to be nothing but receptacles for the deposit of all sorts of refuse, and which I looked upon as likely to have a baneful effect upon the health of the people living there. The Municipal Commissioner kindly lent me the services of a steam fire-engine and I had both wells pumped dry, and the owners cleaned them out.

House-to-house visitation was rigidly carried out, and every man, woman and child was seen by me in company with the Medical Officer daily. When a case was discovered, it was at once removed on a litter to the hospital and the other members of the family segregated, the room thoroughly fumigated by burning tar and sulphur therein with all apertures closed. The tiles of the roof were then removed, the floor was dug up and burnt together with the clothes and bedding and all rubbish found in the house, and compensation paid to the owner. If a case occurred in a temporary hut, it was taken down and burned.

The sanitary measures adopted at the hospital were as follows :—On admission the patients were provided with new clothing and the clothes they wore destroyed: a receptacle containing a disinfectant was placed at the bedside of each, in which all expectorations were deposited and removed at once, urine and faeces were placed in vessels containing chloride of lime and speedily destroyed by fire. At the doors of the wards an automatic sprinkler was erected from my design which kept constantly moist, with a solution of carbolic acid, a lung composed of porous cloth, so that the air inside was always charged with this powerful purifying agent. The disposal of the dead received the most careful attention. When death took place, the corpse was immediately removed to the dead house, the clothing taken off and at once burnt, and the bed and bedding thoroughly disinfected. The bodies after being washed were clothed in new materials supplied on the spot. In the case of Mahomedans the Mullah personally superintended the washing and dressing of the bodies.

From the hospital report it will be observed that 41 cases took place amongst both communities out of an approximate population of 700 souls or 5·85 per cent. Of these people, 650 were Mahomedans, of which 35 were attacked or 5·38 per cent. 27 died or 77·11 per cent. 20 males contracted the disease, and 75 per cent. of them died. Of 15 females attacked, 80 per cent. succumbed. Of the 50 Hindus, 6 were attacked or 12 per cent. Five out of the six died or 83·33 per cent. Peculiar to say, no females of this sect were affected. This may be, in some measure, due to the fact that the Hindu women, being poor, have to work the major portion of the day in the open and are not subjected to the same amount of insanitary seclusion as Mahomedan women are. Plan No. 9 is a chart shewing the progress of the plague from its inception to its decline.

Like all visitations of this kind many desolate people are left helpless—the bread-winners gone. I appealed to the public for monetary aid to assist me in relieving distress and received the following sums:— Mrs. Martelli, Baroda Residency, Rs. 400; Major Hildebrand, Bombay, Rs. 16; and Rs. 50 through Mr. Leask, Acting Health Officer, from Dr. Pollen's fund. This has been a very great boon and has gladdened the hearts of many a widow and orphan. Of the Mahomedans, there are 5 widows and 11 orphans left. Of the Hindus, there are 4 widows left and 22 orphan children mostly young, and of aged parents and relatives dependent upon those who have died, 6, or a total of 42 souls.

The whole slaughter-house staff did their duty in a manner which reflects great credit upon them. I cannot, however, but mention the ready assistance I received at all times from the Assistant Superintendent, Mr. Sanders. He spared no pains to give me his support in dealing with the people; Mr. Evans, too, proved of great use. I cannot speak too highly of the invaluable services rendered by Dr. D. D'Monte, the Medical Officer in charge. He refused the pecuniary remuneration offered to him by the Plague Committee and gave, during the outbreak, well nigh his whole time to the work of attending to the sick and in house-to-house visitation. This meant to him not only a large monetary loss, but also the loss of many clients for some time to come at least. His labours from first to last are beyond all praise, and I would beg to strongly recommend him to favourable notice of the Plague Committee. The Mullah of the Mosque, Hassan Aneef, is well worthy of reward. No man could have worked harder than he did. He was constantly with the sick attending to their wants. He personally washed the bodies of the dead of his own sect and prepared them for burial. He acted as arbitrator in cases of dispute about compensation for burnt clothing, &c. I always found him fair and just, both to me and his own people. Without the ready aid the Mullah afforded me on all occasions, I am confident that the plague operations would have assumed a very different aspect from what they did, and I would urge that a recommendation be sent to Government asking them to be pleased to kindly grant this man a Sanad and a Robe or Dress.

Report of Bandora Slaughter Houses Hospital.

This hospital opened on 20th March 1897 and closed on 17th April 1897. Received 41 patients, of which 34 died.

Cases	... 41	} Previous history of district cases 9, deaths 5.
Recovered	... 7	
Died	... 34	

Very grave opposition was offered by Mahomedans and Hindus to all hospital arrangements, and great difficulties in establishing temporary arrangements were

only met by stringent and conciliatory measures, e.g., the Mahomedan Mullah was appointed as superintendent with the following staff :—

Staff.

- | | |
|-------------------------|------------------------------|
| 1 Mahomedan ward-boy | 3 Bigaries. |
| 1 Mahomedan ward-woman. | 1 Clerk. |
| 4 Sweepers. | 4 Sepoys (supplied by Police |
| 4 Ramoshis. | Superintendent, Thana). |

Sanitary Measures adopted.

1. Fumigation of rooms.
 2. Disinfection of drains.
 3. Removal of cattle-troughs.
 4. Erection of latrine (and enforcement of its use).
 5. Removal (twice daily) of filth.
 6. Cleansing of outlying wells.
 7. Rigid house-to-house visitation.
 8. Segregation of relations in case of patient discovered, with fumigation and disinfection of premises. Burning of clothes and kutchra.
- Compensation being paid in respect of these operations.

Sanitary Measures in Hospital.

1. Provision of hospital clothing.
2. Immediate removal of all discharges from the bed side.
3. Their disinfection or burning.
4. Automatic sprinkler at ward door.
5. Immediate removal of corpses and their dressing and disinfection superintended by the Mullah.

Deaths 34. Of the 34 deaths, the following are the details :—

No.	Sex.	Age.	Caste.	Admission.	Date of Death.
1	Male	45	Hindu	14-2-97	16-2-97*
2	"	10	Mahomedan	21-2-97	22-2-97
4	"	13	"	23-2-97	25-2-97
5	"	45	Hindu	23-2-97	24-2-97
6	"	23	Mahomedan	3-3-97	10-3-97
7	"	27	"	11-3-97	13-3-97
8	Female	8	"	11-3-97	13-3-97
9	Male	9	"	11-3-97	12-3-97
10	"	30	"	13-3-97	14-3-97
11	Female	11	"	13-3-97	16-3-97
12	Male	40	"	13-3-97	15-3-97
13	"	7	"	14-3-97	15-3-97
14	Female	25	"	14-3-97	15-3-97
15	"	62	"	15-3-97	16-3-97
16	"	18	"	15-3-97	16-3-97
17	Male	35	"	15-3-97	17-3-97
18	Female	47	"	16-3-97	17-3-97
19	"	9	"	16-3-97	21-3-97
20	Male	30	Hindu	17-3-97	24-3-97
21	"	19	Mahomedan	18-3-97	24-3-97
24	"	17	Hindu	21-3-97	21-3-97
25	"	10	Mahomedan	21-3-97	21-3-97
26	Female	20	"	21-3-97	22-3-97
27	"	23	"	26-3-97	28-3-97
28	"	26	"	31-3-97	3-4-97
29	Male	35	"	31-3-97	5-4-97
30	"	23	"	31-3-97	5-4-97
34	"	35	"	2-4-97	25-4-97
36	"	40	Hindu	4-4-97	5-4-97.
37	"	39	Mahomedan	8-4-97	14-4-97
38	Female	16	"	11-4-97	10-5-97
41	"	20	"	20-4-97	25-4-97

From this it appears that there died—

Of 35 Mahomedans attacked	...	...	...	27
Of 6 Hindus	„	...	...	5

This hospital bears out the general point observed that the period of life most vulnerable to attack is between the ages of 20 and 30, though there are 11 deaths of patients over the age of 30 recorded and 21 below that age.

Ages of Fatal Cases.

From 5 to 10 years	...	...	...	5 cases.
„ 10 to 20 „	...	...	...	8 „
„ 20 to 30 „	...	...	...	8 „
„ 30 to 40 „	...	...	...	6 „
„ 40 to 50 „	...	...	...	3 „
„ 50 to 60 „	...	...	...	1 „
Above 60 „	...	...	...	1 „

32 cases.

Chapter IX.

Foreign Missions.

On the outbreak in Bombay of the epidemic, which had such far-reaching effect on the commerce and sea traffic of the world, it was natural that all civilised Powers concerned should, in the interests of science, despatch Medical Missions to examine and enquire into the nature and cure of this disease, about which so little was known.

The following Missions presented themselves :—

Egyptian Mission.

Dr. Rogers Pacha, Director-General, Sanitary Department.
Dr. Bitter, Director of the Hygienic Institute, Cairo.
Dr. Ibrahim Pacha, Darsan, Director of the Medical School, Cairo

The German Mission.

1. Geheimer Medicinabrath—Professor Dr. Kock.
2. Geheimer Medicinabrath—Professor Dr. Gaffky.
3. Professor Dr. Pfeiffer.
4. Königlich Bayerischer Stratsartz and Dr. Dieudonné.
5. Privat—O'ocent Dr. Sticker.

The Austrian Mission.

1. Dr. Hermann Franz Müller, M.D., Lecturer for Internal Medicines (Assistant Professor, Nothnagel).
2. Dr. Heinrich, M.D., Assistant, Patholog. Anatom. Institute.
3. Dr. Anton Ghon, M.D., Assistant, Patholog. Anatom. Institute.
4. Dr. Rudolph Pock, M.D., Assistant, Clinical, to Professor Neusser.

The Russian Mission.

Dr. Vladimir Wysokawiez, Pro-	Dr. Daniel Labolotney.
fessor of the Kien University.	Dr. Eugéné Redrow.

In addition to the above, the undermentioned Medical Officers arrived in Bombay from various ports :—

Monsieur Haffkine, Russian.	Monsieur Lorans, French.
„ Yersin, French.	„ Bonneau, „
„ Symonds, „	„ Lustig, Italian.
„ Ladin, „	

Under the orders of the Bombay Government, the Missions were assisted in every way possible. Their instruments and stores were passed through the Customs free of duty; laboratories were built

or found for them, fitted up and placed at their disposal; hospitals were thrown open to them ; and, where caste prejudices did not intervene, means for autopsies were afforded. Owing to the presence of so many Medical Officers, it was found necessary to determine the hospitals in which each Mission should work, and the following arrangement was decided on as likely to meet their wishes :—

The German Mission to work at Parel Hospital.

The Austrian Mission was allotted to the Arthur Road Hospital.

The Russian Specialists practised at the Grant Road Hospital.

Chapter X.

Report on the Outbreak of Plague in the Kolaba District.

On April 25th Mr. Gray, the Collector of Kolaba, at the suggestion of Government, came to consult the Committee, on the state of plague in his district. The places most affected were Alibag, Uran, Panwell, and Theronda. In consequence of this, the Committee (General Gatacre, Surgeon-Major Dimmock, and Mr. James) visited Alibagh on the 28th. Alibagh has a normal population of about 7,000, but in consequence of the plague nearly all the inhabitants had deserted it. Up to the time when the Committee first went there 180 deaths had taken place, and such a panic had set in that only about 400 people were left in the town. The rest had dispersed themselves through the surrounding villages and many were living in the Fort of Alibagh. No local labour for disinfection was available, and accordingly a regular disinfecting staff was promised from Bombay.

The Committee on the 29th of the same month visited Ulva and Panwell. At Panwell, which has a normal population of 10,000, 138 deaths had taken place since the outbreak to the time of the Committee's visit, and about 3,000 people had fled inland to escape from the plague. Hospitals and segregation huts had been built, and disinfection had been started, but all three measures were ineffective through want of superintendence. No one was making use of the segregation huts, and the infected houses had in many cases been only whitewashed on the outside, while the floors of the houses had not been dug up. The dispensary was found in good order. The Committee made arrangements for a hospital for Hindus and another for Mahomedans. On May 3rd Mr. James accompanied by Mr. Gray, the Collector, paid a visit to the villages which lie round Karanja. At Karanja arrangements were made for opening a hospital, the equipment of which, as well as a Hospital Assistant and four ward-boys, were to be provided by the Committee. The disinfection of the village of Kondri was next provided for, to be carried out by the despatch of coolies and staff from Bombay.

At Uran, which was next seen, arrangements were made for house-to-house inspection by the leaders of communities and for the provision of two hospitals for Mahomedans and two for Hindus, one being for the caste generally, the other for Banias and Purbhoos.

At Mora it was found that the plague had practically disappeared, chiefly through the efforts of Mr. Carroll; it was, however, decided to retain the Dharamsala in case the need for a hospital should arise later on.

Out of the whole district the place which had suffered most of all was Theronda. Here out of an original population of about 700, there had been 331 attacks, resulting in no less than 328 deaths up to the 24th of April, almost every case having ended fatally.

But all over the district the scare was so widely spread that it was next to impossible to get any local labour for disinfecting work. The Medical Staff of the District, too, was not capable of dealing with an epidemic that had reached such dimensions. The Plague Committee accordingly made arrangements to supply both labour and experienced disinfecting Inspectors from Bombay. On May 10th Surgeon-Captain Collins, A.M.S., was deputed to take

charge of the whole special arrangements to be taken in hand for the suppression of the plague. Mr. Atkinson, one of the Chief Inspectors of the Bombay Municipality, who had had great experience of disinfecting work in Bombay, was put in charge of that work, and the following staff was despatched to the various centres:—

On the 29th April 150 coolies and three muccadums were sent to Alibagh in charge of Inspector Stazza, and 151 coolies and two muccadums under Inspector Brady to Rewadanda, for work there and at Theronda. **Alibagh.**

On the 4th of May Inspector Jenner and Assistant Surgeon Twells with 25 coolies, two muccadums, and two ward-boys were despatched to Panwell for medical and disinfecting work; 50 local coolies were also set to work under Sub-Inspector Jan Mahommed. **Panwell.**

On the 6th of May 50 coolies and Inspector De Sa, two muccadums and four ward-boys were sent to Karanja for work there and at the villages of Kondri and Kasola. **Karanja.**

Sub-Inspector Jan Saheb, two Hospital Assistants, 25 coolies, eight sweepers and six ward-boys. Ten more sepoy and two Non-Commissioned Officers were sent afterwards. **Uran.**

Inspector Brady, with one Hospital Assistant, one time-keeper, three ward-boys, two muccadums, two cooks, 100 coolies, and two sweepers. **Theronda.**

The work done by Mr. Atkinson, Disinfecting Inspector, and the staff placed under his orders by the Plague Committee was as follows:—

In all 6,502 houses were disinfected in the following towns:—

Panwell	...	...	...	...	...	...	...	535
Uran	...	...	...	...	...	...	...	762
Karanja	...	...	...	...	...	...	...	50
Kondri	...	...	...	...	...	...	...	164
Kasoli	...	...	...	...	...	...	...	42
Alibagh	...	...	...	...	...	...	...	1,342
Theronda	...	...	...	...	...	...	...	487
Snkhar	}	...	...	...	...	...	...	310
Akshi								
Raiwady								
Rewadanda	...	...	...	...	...	...	...	810
Choul	...	...	...	...	...	...	...	1,000
Agraon	...	...	...	...	...	...	...	50

Including flushing down with perchloride of mercury and subsequent lime-washing, digging up floors of infected houses, clearing houses and compounds of rubbish and opening out roofs, the cost of the labour for all this work was only the value of three coolies' labour for one day per house—a result which must be considered to reflect considerable credit upon Mr. Atkinson and his Inspectors.

In the larger towns the Municipal hand fire engines were employed for the disinfecting work; two American rotary pumps were also purchased. In the island of Karanja and the village of Theronda small garden hand pumps were employed.

The district officers gave every assistance and the Police in particular made themselves useful.

In Chawal the local Brahmins were opposed from the first to all plague operations, and it was only by the personal exertions of Inspector Brady that the work was done at all. When he began the work, the villagers, incited by the Brahmins, turned out armed with sticks to oppose his men by force, and he had some trouble to pacify them; afterwards the Bombay coolies returned to Bombay and local labour was obtained for the work. Many of the villagers gave a written guarantee that they would carry out the necessary disinfection under the superintendence of Mr. Brady, and accordingly were then not interfered with by the Committee's coolies.

Obstruction was also met with in Rewadanda and Uran, but in most of the towns and villages in which work was done the people came forward after a time and actually assisted in the operations and expressed their gratitude to the staff for their exertions. When all was finished they were allowed to return to their houses.

With the exception of Uran, where there are still a few cases, and which is reported to be in a thoroughly insanitary state, the district of Kolaba is reported by Mr. Atkinson to be free from plague, and the people have been allowed to return to their houses. The main object which the Plague Committee set before themselves, therefore, when they undertook the work has been attained, *viz.*, the execution of the necessary disinfection in time to allow the people to get back into their houses before the rains.

Mr. Atkinson speaks very strongly of the insanitary state of Uran and Panwell. The Municipality of the former town appears to have neglected its duty for some time past. The plague has not yet been eradicated from it, while cholera has broken out there lately, and guinea-worm is reported to be extremely prevalent. On such places as these a mere disinfection can make only a temporary impression; and if they are not to become hotbeds of plague in the future, it seems that some further steps are required to complete the cleansing process.

The report of Surgeon-Captain Collins, which follows, gives a full account of the history of the outbreak of the plague in this district, and of his own work there.

First Cases.

The first case of bubonic plague in the district, so far as I can ascertain, appears to be that of one Kashinath Sundarji, who acquired the disease in Bombay and died in Alibag on 27th December 1896. The second imported case occurred on 7th February in Alibag, and the third on 17th February 1897. The first indigenous case was reported on 24th March. Between 18th February and 23rd March six deaths were recorded from fever. Some of these were very probably due to plague, but were not so returned, as the Municipal authorities did not get sufficiently early information to permit of their inspecting the dead bodies before disposal. Isolated imported cases also occurred in Mangaon, Mahad, and Roha. Fortunately owing to the dryness of the soil, distance from the sea-shore, and absence of luxuriant vegetation, which makes the climate damp and malarious, or, probably to some other unknown cause, the villages in which these single cases occurred did not furnish a fruitful soil for the plague bacilli to develop in. In every case the infection died with the patient, and did not spread so as to affect others. No very strict or scientific methods of segregation and disinfection were adopted, but the natural conditions of the villages seem to have been so favourable to the prevention of the disease from spreading, that the contagion did not travel beyond the imported case, and there has been no indigenous victim to the epidemic in any of these villages.

In the village of Wadawli, however, in the taluka of Mangaon, an instance occurred in which the contagion was directly conveyed to another person, who soon died from its effect. A man suffering from plague arrived in Wadawli from Bombay; the villagers believed that by removing the blood from the bubo

they could cure it and reduce the fever. They decided on wet-cupping as the most suitable method of accomplishing this, and the native cupping instrument was used, which is of very rough construction and requires the air to be removed from it by the mouth. The man who performed the operation caught the contagion, which was so directly communicated to him that he died within a short time, having shown all the symptoms of bubonic plague.

With this exception there has not been a single indigenous case in the three talukas of Mahad, Mangaon, and Roha, although there were at least ten imported cases.

In Alibag taluka several villages were affected at the commencement of **Outbreak** the outbreak, notably Theronda and Alibag. Akshi, Awas, Rowadanda, and Choul had each a few indigenous cases. In all these places, the first introduction of plague was invariably due to communication with infected areas. During the months of October and November, when the full force and dreadful effects of the epidemic became evident in Bombay, very many residents of that island left it in panic, and took refuge in the neighbouring towns. Alibag and Awas, being near to Bombay, and easy of access to native crafts, were selected by many people as their refuge. Communication with Bombay was increased, and the relatives and friends in Bombay of the inhabitants of Kolaba returned to Alibag, Awas, Rowadanda, and other villages on the coast. Among these persons some were undoubtedly affected with plague, and the rules of medical inspection in Bombay not being strictly in force at that time, people actually suffering from the pestilence found it easy to escape across the harbour and enter the Kolaba district. It is stated that some of the servants of Angré and Biwalkar, two leading natives in Alibag, brought the disease from Bombay and were the first victims, and that after their death the germs spread rapidly through the whole town. With regard to the first introduction of plague into Theronda, it appears that some of the crew of a native craft, which had gone to Bombay, caught the disease in that city; they returned in the same boat to Theronda, where they died. The disease was introduced into Rowadanda by an old woman of Koli caste, who was affected with the plague, going from Theronda to the house of one of her relatives in Rowadanda, where she died after a few days. The true cause of her death was at first concealed, and ~~it~~ was only on the appearance of dead rats in the house that the Police Officers investigated the case, and found that she had died of plague.

It appears, therefore, that the cause of the first introduction of plague into the villages was invariably communication with an affected area; and that wherever it has broken out, it can be traced to the germs having been introduced by an infected person. On the other hand, however, it is evident that plague does not always occur in an epidemic form in every village in which an imported case has occurred. There are many instances where the disease, introduced by an imported case, has died with the patient, and nothing more has been heard of it afterwards.

By the middle of March the epidemic had become general all ~~through~~ **Epidemic stage.** the district, and from the 6th March regular daily returns were received shewing the progress of the disease. Up to this date 174 cases and 59 deaths had occurred, and now for the week ending 13th March, 18 cases and 11 deaths were reported,—namely, eight cases and four deaths at Panwel; at Uran six attacks and three deaths; at Matheran one fatal case; and at Tarjira two attacks and two deaths. With a view to coping with the epidemic, plague hospitals were opened at Panwel, More, Uran, Karauja, Pan, Alibag, and Rowadanda, and each placed in charge of a Hospital Assistant. The provisions of Act III of 1897 were put into force; plague authorities

were appointed ; arrangements were made for house-to-house inspection ; segregation camps were established ; and orders were issued to have the towns and villages disinfected and put into as sanitary a condition as possible. The Inspector-General of Police sanctioned the enlistment of 110 extra Police for the District, and these were posted for duty to the different towns, with a view to establishing a thorough inspection of houses for information of fresh attacks. All infected houses were vacated on the occurrence of cases of plague ; the houses were then disinfected, limewashed, and the tiles or thatches removed to allow of free entrance of air and sunshine ; the streets and gutters were also flushed and sprinkled with carbolic powder. On the 3rd March Professor Haffkine, at the invitation of Mr. E. W. Carrol, went to Uran and inoculated 110 persons with his prophylactic serum ; and, again, on 13th March he inoculated and re-inoculated in all 192 persons, including 34 Kolis, 73 Parsees, and 5 Europeans.

The plague now began to increase and spread rapidly ; at Alibag, Panwel, and Theronda it assumed alarming proportions. The latter place is divided into North, Middle, and South. In North Theronda there were 400 deaths, out of a population of 700 inhabitants ; while in South Theronda there were 100 deaths out of a population of 400 ; strange to relate Middle Theronda, which, as the name implies, is situated between the other two divisions of the town, completely escaped the ravages of the epidemic. The maximum intensity of the outbreak was reached at the beginning of May, the returns for the week ending 7th May showing 227 attacks and 162 deaths. From this date the plague began to decrease steadily until the present time ; the number of attacks and deaths for the week ending 2nd-July being three and six respectively.

Visit of Bombay Plague Committee.

The Bombay Plague Committee visited the district at the end of April. They first came to Alibag, where they found that out of a population of 7,000 inhabitants only some 400 had remained in the town, the remainder having fled panic-stricken into the surrounding villages ; a few days later Rewadanda, Theronda, and Choul were visited, also Panwel, Mora, Uran, and Karanja. As the result of these visits it was decided that all the towns in the district should be thoroughly limewashed and disinfected on scientific principles with a view to putting them in a sound sanitary condition, and the following disinfecting staffs were despatched to the different places :—To Theronda and Rewadanda, Inspector Brady and 100 coolies ; to Alibag, Inspector Stazza and 150 coolies ; to Karanja, Inspector De Sa and 50 coolies ; to Uran, Inspector Jan Saheb and 25 coolies ; and to Panwel, Inspector Jenner and 50 coolies. The whole of the operations were placed under the superintendence of Mr. T. G. B. Atkinson. The disinfection was begun early in May, and completed in a satisfactory manner by the end of June. The benefits to the district of this thorough cleansing are incalculable. All the towns that were in a very filthy condition have now been brought to a condition of average cleanliness.

Throughout the epidemic the difficulties in the way of combating the evil, owing to the prejudices of the masses and the scarcity of labour, were enormous. Great trouble was experienced in getting people to disclose the occurrence of cases of plague, and then in inducing them to remove the plague-stricken patients and their families to the hospitals and segregation camps. These difficulties were more especially experienced in dealing with the Brahmins, who all through gave us very little assistance in quelling the disease, though in almost every case patients who recovered in hospital expressed their regret that more of their fellow-sufferers did not avail themselves of the hospitals, and invariably spoke very highly of the manner in which they were treated.

Chapter XI.

Report on the Operations carried out at Cutch Mandvi.

The town of Mandvi lies some 200 miles north-west of Bombay, and, being the home of many Bombay traders, in addition to carrying on a large trade with Karachi, an outbreak of plague might naturally have been expected there. The rise and progress of the disease is treated at length in the attached report of Surgeon-Lieutenant-Colonel Wilkins, D.S.O. As far as the Plague Committee was concerned, the beginning of events was the receipt of a private telegram by the Chairman from Dr. Lowson, Special Plague Commissioner, on April 25th. In this he asked for a European Medical Officer to be sent at once and some Hindu ward-boys. On the following day another telegram from the same source was communicated to the Chairman by His Excellency the Governor to the same effect, namely, that the situation was desperate, the people panic-stricken and not attending on their sick. On the previous day no less than 73 deaths had occurred in a population of 25,000.

Dr. Lowson suggested that Dr. Ricketts, who was at Bhuj, the capital of the Runn of Cutch, on military duty, should be put in charge of the operations; the Committee, however, thought that one of their own medical men, who had acquired familiarity in Bombay both with the plague itself and the methods adopted for stamping it out, would be preferable for such an important work. The approval of His Highness the Rao of Cutch and the consent of the Principal Medical Officer, Bombay Command, having been obtained, Surgeon-Lieutenant-Colonel Wilkins, D.S.O., who had been in charge of No. 5 District under the Plague Committee, was despatched by the boat leaving at 10 o'clock on the morning of the 27th of April.

There was necessarily much to be done to get together a staff of nurses, &c., during the night of the 26th. Various officers were detailed by telephone for this duty, and finally Dr. Wilkins, accompanied by a native medical practitioner, four nurses, and one hospital assistant, left by the morning steamer. They took with them six sepoy and one lance *naiik* from the 21st Bombay Infantry, three ambulances, and four servants.

Further relays of staff, medical and disinfecting, were sent from time to time as fast as they could be collected, with two experienced Inspectors and a large staff of Bombay coolies for disinfecting work. Surgeon-Captain Mason followed on the 11th of May.

All these arrangements met with the ready approval of His Highness the Rao, by whom the expenses were defrayed.

The attached reports of Drs. Wilkins and Mason give a full account of the operations carried on there by themselves and their staff.

Report of the Plague Epidemic in Cutch-Mandvi.

BY SURG.-LIEUT.-COL. J. S. WILKINS, D.S.O., I.M.S.

I was informed early in the morning of the 27th April by General Gatacre that he wished me to proceed to Cutch-Mandvi with Dr. Shroff and a staff of Nurses and to take measures against the plague which was raging there with great severity. Accordingly at 9-30 the same morning I was on board the B. I. S. N. Co.'s steamer "Kola," and met four nurses, one Parsee Practitioner employed on plague duty at Bombay, one Hospital Assistant, six Ward Orderlies, who, with three ambulance carriages and some clothing, formed the staff of future operations. After two days we arrived at Cutch-Mandvi and were met by Major Hyde Cates, the Political Agent, and Dr. Lowson, one of the Plague Commissioners, who had already begun operations. The accounts given by these of the results of the devastation of the disease were very terrible, and the work that lay before us seemed to be of a very heavy nature.

Before passing on to particulars I think it is as well to give some idea of the city of Mandvi and its surroundings.

Cutch-Mandvi is one of the largest seaport towns situated on the Gulf of Cutch, and is of great importance as one of the centres of trade for this part of the country, trade being carried on with Zanzibar, ports on the Persian Gulf, and all along the adjacent coasts; also with Bombay and Karachi. The town is almost square in shape, and, roughly speaking, covers an area of a square mile; there are high walls of about 20 feet in height with bastions here and there surrounding the city, and four large gates, and some small ones. On proceeding inside the city through one of the gates we come on a dense mass of houses mostly built of stone and evidently very much overcrowded during ordinary times. The so-called streets are in reality narrow and tortuous lanes, the widest part not being much more than 14 feet wide, and most of them very much less than 10 feet wide. The houses are for the most part built of stone and are usually one storey in height, and nearly all of them enclosed by high walls with gateways leading into the court-yard, which is surrounded by small rooms which are ill-ventilated, gloomy and dirty, and the lower rooms usually without any plinth and sometimes below the ground level. The court-yard is generally used as a stable for cows and other animals, and, as it is not the custom to clean these yards, the smell from them is usually very offensive. The habits of the inhabitants are decidedly dirty, the latrines are usually the streets, and it is said that it is not considered etiquette on the part of a stranger to enter the city before 8 a.m., up to which hour the inhabitants use the streets for purposes of nature. There are a few latrines attached to the walls of the city on its western side, but these are hardly ever cleaned and the consequence of this free-and-easy method of sanitation may be well imagined, and it is not to be wondered at that once the plague bacillus found a haven of rest here it flourished to a great degree, for it had all its requirements, *vis.*, filth, darkness, dense overcrowding, and no ventilation.

The streets have no drains, and I am informed that during the rains they are in a very muddy condition.

Origin of the Plague.—The history of the origin of the plague is uncertain, but the generally conceived idea is that it was brought from Karachi. To bear out the statement, I have been at some trouble collecting evidence, and one of the residents here during the whole of the epidemic, and one likely to know about it, states that a segregation camp for passengers from Bombay who were suffering from the plague was constructed towards the end of the year 1896. About February 1897 quarantine was enforced against passengers from Bombay and Karachi, and about March last a few cases of plague occurred in Maska, a village about three miles away from Mandvi, whereupon a special Segregation Act was passed for the Province of Cutch. The origin of this disease in Maska is this: A woman and her child, passengers from Karachi, who were affected with plague were in the camp near Maska, and this woman, who from the symptoms apparently suffered from the pneumonic type of the disease, was nursed by her sister-in-law, a resident of Maska; the woman died, and her attendant went back to the village and died of the disease and ten others also, who were members of the same family. Segregation and isolation stopped the plague there, and no further cases occurred for a time. About the beginning of March a few isolated cases of plague occurred in Mandvi, and on 25th March two cases occurred amongst the Mahomedans at Sonuwallá Náka and one case in the Khatri Chowk amongst the Hindoo weavers. Segregation and isolation were adopted, and the disease stopped. Unfortunately these measures were put a stop to, and a Plague Committee was formed; most of the members opposing these measures. Owing to the relaxing of these rules and the great influx of people from Bombay and Karachi, the disease once more sprang up and spread with great rapidity. From the 21st March to the 12th April there were 37 cases in all which were found, but the death-rate evidently must have been excessive. As rumours of the heavy death-rate reached the ears of the Political Agent at Bhuj, he came down at once on the 12th and found a great many people dying of the disease. Seeing this state of affairs he at once telegraphed to the Plague Committee, requesting help, and they sent down Dr. Lowson, the Plague Commissioner, who arrived, I think, about the 22nd April and immediately set to work with the help of the Political Agent and the local authorities to get the sick into hospital.

Further help was asked for from Bombay, with the result that I and the staff mentioned before were despatched. Dr. Lowson remained till the 2nd of May, or about 10 days altogether.

Death Registration.—Some method of arriving at the number of deaths was required, and it was found that the surest was the posting of reliable men at the various burial and burning grounds, who would take the name and address of each victim. In this way some approximate number of deaths could be obtained. The deaths in the city could fairly easily be estimated by posting men at the gates to count the dead as they were removed to the various grounds outside. These measures were taken on the 24th April, when the first attempt at registration of deaths was begun, and which has been kept up regularly ever since.

On arrival here I found that two hospitals had been open, one for the Hindoos called the "Brahampuri" and another for Mahomedans. The former was a large pucca-built Dharamshala, very suitable for a hospital and capable of accommodating about 150 patients. The open verandah-like long rooms were about 200 feet in length on two sides of a square, the other sides being occupied as cooking room, orderlies' quarters, &c; the middle was a quadrangle containing a well of water.

The situation of the place was also very convenient, being outside the city walls and near the burning ghat, where so many of the unfortunate people had eventually to go. This building belongs to a wealthy Hindoo called Riddhigau Bava, who charitably

offered the whole for the accommodation of his afflicted country-people, at the same time giving them their food out of his own pocket. The Mahomedan Hospital was conveniently situated also outside the walls and on the bank of the river, and was previously used as a Dispensary. It was capable of accommodating about 30 or 40 people, and was in every respect a suitable place for an hospital. When I arrived at Mandvi on the 29th, there were 58 cases admitted into the Hindoo Hospital the previous day, and a few cases in the Mahomedan Hospital. I will speak of the hospitals further on.

Methods adopted.—On going over the town I saw that the first thing to be done was to get the sick out of their houses into the hospital and then to cleanse the whole town, removing as many people as possible into temporary sheds.

Search Parties.—For the removal of the sick we formed search parties in the city, and we had very difficult work getting at these, as the people were very reluctant to have their sick taken away to the hospital, and every endeavour was made to evade the search parties. However, a great many cases were found daily; a greater number died in their houses. In our visitation to the houses many cases were found either dead or dying, and all feeling of humanity amongst the people seemed to be blunted, as on several occasions we unlocked doors closed from the outside and found cases left to die, chiefly women. This house-to-house visitation was instituted at once and is still going on, at the necessity for removing every infectious agent still remains, and the people are so apathetic or ignorant that they prefer the risk of infection in their own houses to the removal to the hospitals. The Plague Committee had sent three ambulance carriages with me, and we had to obtain five others from Bombay to enable the sick to be removed in comfort. The country carts used with the ambulances were rather a rough method of transport, but, strange to say, some of the people preferred these bullock-carts to the ambulances.

The next thing to be done was to cleanse the houses, and this seemed a very formidable affair, since, as stated before, the whole place was very densely crowded with houses, and very dirty. I could not obtain coolies in the city or suburbs, as the men were afraid to do the work, and so I had to telegraph to Bombay for 200 coolies and a couple of capable European inspectors; also for a large quantity of lime and materials for disinfection. These demands were promptly attended to, and on the 4th of May the men were set to work at the really arduous work of cleansing the town.

The usual measures were taken, viz., opening out the rooms as much as possible to light and air, and removal of a part of the tiles, taking out all rubbish and clothes and burning them, the use liberally of disinfectants, and, finally, hot lime washing the whole premises.

Mr. Atts, my energetic and capable inspector, found that the addition of about 12 oz. of carbolic acid to half a tub of lime made it more biting and gave the microbes less chance, and he also found out that equal quantities of red carbolic powder and chloride of lime placed in an earthenware receptacle and left in a room produce a most pungent and powerful deodorising effect, cleansing the atmosphere in some of these rooms, locked and left for many weeks with dead rats, &c., in a very short time.

The Bombay coolies and inspectors being men accustomed to the work in Bombay were very efficient, and the work proceeded quickly. I was eventually able to replace these Bombay men by local men who took heart on seeing the plague decrease, I gradually increased my gang of coolies by local men, and as the Bombay men were a great expense to the State, I eventually removed them all except 20 men and my inspector, Mr. Atts. They left on the 20th May, and I regret to say that 8 men were attacked and died of the plague.

In order to meet all requirements, I had small gangs of coolies also placed at the gates, so that when any cases or dead bodies were removed through them, these men were employed especially to cleanse and disinfect the houses inhabited by these. Latterly we have taken whole streets at a time and opened and cleansed the houses locked by their owners, who were away. These houses are unlocked in the presence of the Magistrate and Police, and the contents of the houses removed outside and the houses cleansed; the goods are replaced by the Magistrate in the evening and the houses locked and sealed. In this way nearly the whole town is now fairly well cleansed, and, I have no doubt, is far cleaner than it has been for a century or two.

I enclose report on the number of houses limewashed and disinfected since we have taken the work in hand.

Mr. Atts reports on the 21st June:—"3,338 houses were disinfected by me, containing 16,540 rooms. Tiles were taken off partially from the roofs of 2,540 houses to admit light and air; 8,843 coolies were employed on the above works from the 5th May to 21st June. I found it necessary to use about 12 oz. of carbolic acid to every half cask of mixed lime, as the lime was more or less slaked. Care was taken to freely use this solution to the walls, more especially to the flooring until it fairly permeated it. In every instance the men were not allowed to enter the infected houses until some chloride of lime was used, and in some extreme cases where the smell of dead rats and cats was unbearable, I fumigated the rooms with about 2 lbs. of chloride of lime with 2 lbs. of disinfecting powder. This fumigation answered the purpose very satisfactorily, although expensive. In some extreme cases I used the pump and washed the walls and flooring with a solution of carbolic acid, and then limewashed the place with carbolic acid in lime. I found nearly 50 per cent. of the houses disinfected by me had dead cats and rats, and I believe if the disinfection had been started immediately the plague broke out (a month prior to our coming here) one-half of the mortality would not have taken place. The whole length and breadth of the town was fairly infected when we came."

On the breaking out of the plague at Mandvi, and when the disease was pronounced and fatal, a large proportion of the inhabitants, estimated at about 10,000 people, took refuge all around the town in the various gardens there are about, and also outside the villages within easy reach of the city. On our arrival here, it was proposed to erect sheds about a mile to the west of the city in a convenient place, so that the inhabitants of the houses, where there were sick, could be kept under observation; and with this view a long row of comfortable sheds were erected, but the people refused to make use of them and preferred to live in the gardens. Every endeavour short of actual force was employed, but failed, and it was concluded that it was better that they should be allowed to live in huts in these gardens, where they had at all events pure air and light, than that they should leave their houses and carry infection to other houses in the town. So a careful watch was placed on the villages and gardens, and the people of the villages warned not to enter Mandvi or allow Mandvi people to enter their villages. In most instances these warnings were not heeded, and cases of plague occurred in villages, whether prior to the intimation, when the inhabitants fled in all directions, or subsequent, it is difficult to determine; at all events, the attempt to segregate the inhabitants in these huts made for them failed. The reason given was that certain classes would not live near others. In case I were called on to take similar measures again, I think I should feel inclined to act differently—by calling the headman of each caste and getting him to select a spot for a camp which would answer the purpose, and making him responsible for his caste people going there. There are a great number of gardens around the city of Mandvi and adjacent villages, and these afforded shelter to the refugees, who in most instances

made themselves temporary booths and huts and lived in them with their families. A great many cases, I have no doubt, occurred amongst them, but I think it would have been much better if they could have been persuaded to live in the segregation huts, where a better watch could have been kept on them and cases removed as they occurred.

In the city itself all the gates but two were closed, and a watch kept on these by military sepoy from Bhuj, who were also posted around the city at one time. On any case being found, the residents of the house were sent out of the city and the house closed for linewashing, and after cleansing thoroughly and removing tiles to some extent, the house was sealed, so that it could not be used again for some time. In this way a good deal of the city was evacuated.

HOSPITALS.

The most important Hospital was the Hindu Hospital, which I have stated before was in every way suitable for a plague hospital, being fairly isolated, very airy and commodious and having other facilities. The Hospital was opened on the 28th April, the day before we arrived here, and there were 53 cases admitted. The patients had cots of native manufacture made for them and mattresses at first of cotton but latterly of straw, and as many other requirements as we could obtain. There were many things which we required, and as these could not be obtained here, we had to send to Bombay for them, and carry on as well as we could without. It was hard work for the nurses and subordinates, as the cases came in rapidly, and we were short-handed. At one time I calculated that there was at the rate of one nurse to about 30 patients. As time went on we were supplied with medicines, many necessities, such as thermometers, waterproof sheets, &c., &c., from Bombay, and most needed of all, the first batch of nurses and medical attendants were supplied on the 13th May.

The following were the admissions in this Hospital for the nine weeks from 28th April up to 21st June :—

Date.	Admitted.	Died.	Discharged.	Remaining.
From 28th to 30th April ...	92	28	...	...
From 1st May to 21st June. {	738	511	127	...
	107	107	112	52
	<hr/>	<hr/>	<hr/>	<hr/>
Total ...	937	646	239	52
	<hr/>	<hr/>	<hr/>	<hr/>

The largest number in Hospital at one time was 184 on the 24th May.

The largest number of admissions was on the opening day, when we had 53 cases and on the 4th May, when we had 40 cases come in. The daily average admission for May was 23·8. The daily average death for May was 16·4.

For June up to date (21st) the daily average admissions was 5·1 and the daily average death was the same (5·1), or same number of deaths as admissions.

The Brahmajneri Hindu Hospital Returns.

Date.	Admitted.	Discharged.	Died.	Remaining.
April 28th ...	53	0	4	49
" 29th ...	27	0	8	68
" 30th ...	12	0	16	64
	<hr/>	<hr/>	<hr/>	<hr/>
	92	0	28	0

The Brahmavari Hindu Hospital Returns—contd.

Date.	Admitted.	Discharged.	Died.	Remaining.
May 1st	33	0	24	73
" 2nd	28	0	32	69
" 3rd	36	0	17	88
" 4th	40	0	24	104
" 5th	30	0	21	113
" 6th	18	0	18	113
" 7th	16	0	13	116
" 8th	21	0	15	122
" 9th	28	7	16	127
" 10th	29	0	15	141
" 11th	19	4	20	136
" 12th	26	4	22	136
" 13th	21	2	10	145
" 14th	17	22	18	122
" 15th	20	0	15	127
" 16th	17	0	13	131
" 17th	32	1	15	147
" 18th	35	7	18	157
" 19th	13	1	23	146
" 20th	33	7	15	157
" 21st	15	1	8	163
" 22nd	24	0	11	176
" 23rd	22	4	11	180
" 24th	15	8	18	169
" 25th	30	1	14	184
" 26th	20	22	24	158
" 27th	24	12	12	158
" 28th	14	4	8	160
" 29th	30	9	12	169
" 30th	14	5	12	166
" 31st	18	6	14	164
	<hr/> 738	<hr/> 127	<hr/> 511	<hr/> ...
June 1st	15	0	12	167
" 2nd	8	11	11	153
" 3rd	10	13	11	139
" 4th	12	2	9	140
" 5th	18	5	8	135
" 6th	7	13	11	125
" 7th	2	10	10	107
" 8th	3	0	7	103
" 9th	4	8	3	96
" 10th	4	13	2	85
" 11th	1	0	5	81
" 12th	7	14	5	69
" 13th	1	3	1	66
" 14th	2	3	2	63
" 15th	0	6	1	56
" 16th	3	0	0	59
" 17th	3	5	2	55
" 18th	0	1	0	54
" 19th	1	0	0	55
" 20th	1	0	2	54
" 21st	5	5	2	52
	<hr/> 107	<hr/> 112	<hr/> 107	<hr/> ...

This gives 68·9 per cent. of deaths of all cases of admissions, not omitting those moribund cases, which died immediately after admission, or those cases which were brought in practically convalescent. (Every case suffering from plague in the city was removed to hospital when found by the search parties.)

The Hospital was divided into two portions—one wing for females, and the other for males; but as the patients flocked in, and the female ward in particular got much overcrowded, I had three long sheds built in the quadrangle. The two long pucca-built wards were then given over to the females—who had by far the greater number of sick—and one of the chappars or sheds given for the males with a small ward in the building (where about 30 cases could be accommodated). This relieved the tension in the wards, and we used the second shed as a convalescent ward for females and the third as a convalescent for males.

A batch of coolies were always on the premises with plenty of lime ready, and the wards were kept as clean as possible, and the use of disinfectants was free. To allow of greater ventilation the tiles were removed here and there and roof ventilation was then obtained.

It is impossible to describe in words the Hospital and its sights. The two long wards full of sick lying side by side in every stage of this dreadful disease; the nurses going about here and there in their merciful work; the ward orderlies, and other attendants; outside the constant admission of patients in carts and ambulance carriages; and in one angle of the square the dead lying in numbers prior to removal to the Burning Ghât near. It was a mournful sight that met our eyes every morning and evening when we had to pass near the Burning Ghât and saw the numerous fires which told of the heavy mortality. The whole of May and the first week of June, or for about five weeks, the admissions and deaths were heavy, and it was not till about the second week in June that anything like a sensible diminution in the admissions and deaths occurred. The discharges cured, also, were few till about the middle of May, and I am afraid many were sent out with their buboes not quite healed, so as to make room for others who had to be admitted. When it is considered that in this Hospital alone 937 cases have been admitted up to the third week in June, it will be seen that the work was of no light character.

The Hindu Hospital was in charge of Surgeon-Captain Mason, A.M.S., and he will give in a separate report an account of the work in its clinical aspect of the disease. There were at one time from 4 to 8 nurses attached to this Hospital, where the number of patients were far above any of the others.

Two medical practitioners from Bombay (Drs. Shroff and Nanji) were under Dr. Mason. Three Hospital assistants, 12 military ward orderlies, 6 ayahs for the female wards, sweepers, &c., formed the establishment. There were necessarily many changes as patients increased in number or decreased.

On the 16th June a case of erysipelas broke out in the female ward, and 5 cases with wounds got infected, but these were promptly isolated and the disease stopped.

The Hajeera Hospital.—The Borah community of Mandvi numbers about 1,500 souls, and their Hospital was situated outside the city in the Hajeera, one of the suburbs. Owing to the foresight and thoughtfulness of the leaders of this community, Messrs. Jafferji Carimji Maldivalla and Mahomed Ali Khanbhoy, measures to meet all requirements for the plague were taken at an early date, about the first week in April, and the whole of the community were taken out of the city and segregated in huts constructed for them at Hajeera, and a line of cháp-rás was constructed near at hand for the sick.

It was not till 30th April that returns from this Hospital were begun, and from 30th April to the 12th June, on which date the Hospital was closed, the following are the admissions, &c., according to our registers :—

Admitted.	Discharged.	Died.
91	33	53

This result compares very favourably with the other Hospitals. All requisites for this Hospital were supplied by the community, and when it could be done, I detailed one lady doctor Mrs. Van Ingen, nurse Neroy, and an assistant, Mr. Rajaballi, to attend to the sick.

Owing to the enlightened ideas of Mr. Mahomed Ali, he persuaded his countrymen to have Dr. Yersin's prophylactic inoculation, and nearly 400 men were inoculated, and lately 191 children were similarly inoculated by Dr. Simond of the Paris Institute. Owing partly to these measures, I believe, the disease in this community has practically stopped at a very much earlier date than it has in the others. Although I have no definite data to go on, and trust to Mr. Mahomed Ali's word, I have no reason to doubt the fact that he states to me that none of those inoculated have contracted the disease. Yersin's inoculations were practically painless and produced hardly any unpleasant after-results. But I am informed that Dr. Simond's Serum is stronger, and that the little ones injected were affected with a good deal of after-pain, and in some instances accompanied with fever.

The Mahomedan Hospital.—This Hospital, as stated before, was originally a dispensary and situated on the river bank outside the city walls. It is capable of accommodating about 30 or 40 sick. When it was opened for plague-patients, it was originally intended that it should be used for all classes of Mahomedans, and supplemented by utilising one or two Dharmashalas near in case it was overcrowded; but I had the greatest difficulty in persuading any of the other Mahomedans, *viz.*, the Khatri and the Khoja Memons, to use this place, and was eventually forced to provide accommodation for these classes elsewhere as will be shewn. This Hospital was not at all patronised till very late in the epidemic, and the cases were comparatively few.

The returns for this Hospital are as follows :—

Admitted.	Discharged.	Died.	Remaining.
103	31	65	7

This Hospital was under Surgeon-Captain Mason with Dr. Karanjia, a local practitioner, to help him. I was able to allow them the services of a nurse, and latterly the three English nurses attached to the Khoja Hospital quite near, have kindly given their help in attending to the patients.

The Khatri Hospital.—This section of the Mahomedan community would have nothing to do with the Hospital set apart for the Mahomedans, and set up for themselves constructions of badly-made huts on the north of the city walls, and, as they totally disregarded the usual laws of isolation of sick and mingled with them freely, the death-rate must have been very high. However, after a great deal of persuasion, we managed, with the help of their head men, to select a very convenient and suitable spot near their co-religionists, the Hajeera people, and gave them the services of a hospital assistant and a lady doctor Mrs. Van Ingen.

The situation and construction of this Hospital was by far the best of all the temporary sheds, and after once removing to these, their cases did very well indeed. The Hospital was opened for them on the 19th May, when they sent in 29 cases, and from that time till the date was closed, *viz.*, the 13th June, we had—

Admitted.	Discharged.	Died.
60	37	23

The Khoja Memons.—This section of the Mahomedan community were also very unwilling to be treated with other Mahomedans and made for themselves sheds outside the city, where we were obliged to look after them as well as we could manage

it. I gave them the services of Dr. Van Ingen and a Mahomedan assistant, and this plan was carried out until the first week in June, when, owing to the kindness and humanity of Mr. Jairaj Pirkhoy of Bombay, a staff of nurses and assistants were sent here, and the sick were then transferred to a Dharamshala opposite the Mahomedan Hospital, and were here properly looked after. The only regret is that these were not sent out earlier when the disease was so virulent amongst all the people. These nurses also took charge of the nursing of the sick in the Mahomedan Hospital opposite them, as they could spare the time, and were anxious to do as much as they could for the sick. The following are the returns of this Hospital up to 21st June :—

Admitted.	Discharged.	Died.	Remaining.
29	17	3	9

A great many of these cases were convalescent when admitted, and that explains the low mortality.

Salaya Village and its Hospital.—The village of Salaya on the eastern bank of the river Rukmavati is about a mile and-a-half away from the city of Mandvi. The village consists chiefly of Mahomedans who are boatmen and fishermen. The population is about 4,000 souls. The houses are chiefly built of bricks and mud, and there is a clean look about the outside of the place. The inside of the houses are, as in most Mahomedan places, shut out from the light and air, and the rooms are gloomy and dark. They are ignorant and rather inclined to be fanatical, and the usual answer that one obtained to any remonstrance about the treatment of their sick by their method was that it was "God's will, and if they were to die they must die." It will be seen from this that any efforts to isolate and segregate and to introduce house visitation would not be welcome, and it was only very gradually that they began to see the benefits of having their sick treated separately and the blessings of good nursing and looking after. I do not think even now that they quite appreciate our efforts, and it was only on sheer compulsion that they have been made to give in to us and they still evade search parties and die in their houses without proper treatment. The isolation of their sick was their first concession, and we built them a few sheds not far from their village and had some of their sick people removed into them. After this they began to take our medicines, and finally they allowed our medical subordinates to look after their sick and our nurses to treat their wounds. While these measures were being introduced, a great many of their people were dying from the disease in their houses, and the death-rate amongst these people is very high indeed. As there is no pucca-built house where their sick can be placed for the monsoon months, I have had some rows of huts constructed for them with plinths, and made as watertight as possible.

These people have suffered very severely from the epidemic and when the disease is practically stopped amongst the townspeople, they even now have a larger proportion of sick in Hospital and have not yet got rid of the disease owing to their stupid prejudices.

It was very difficult to know exactly what number of sick they had in their sheds and houses, and the returns were not correct till the 12th May when a proper system was allowed.

Both Dr. Yersin and Dr. Simond were anxious to preventively-inoculate these people, but they were so adverse to it that they refused to submit although some of their head men were inoculated as an example.

The following are the returns for this Hospital :—

Admitted.	Discharged.	Died.
235	40	335

As stated, it was not till the 12th May that correct returns could be obtained, and prior to that date all deaths in the city were returned in the hospital returns sent ; so that I have thought it best to leave this out in the total of all hospitals and show it separately. I believe that the admissions are fairly correct. These six, then, were the hospitals which were opened for the treatment of the plague cases, and the total numbers of treated, &c., are as follows :—

From 24th April to 21st June.

	Admitted.	Discharged.	Died.	Remaining
Hindoos ...	937	239	646	52
Hajeera (Bora) ...	91	38	53	0
Mahomedans ...	103	31	65	7
Khatri Mahomedans.	60	37	23	0
Khojah do.	29	17	3	9
Total ...	1,220	362	790	68
Salaya Hospital (unreliable).				
Fairly correct ...	235	40	335 (doubtful).	
Grand Total ...	1,455			

Requrements. —The improvements which ought to be carried out in Outch-Mandvi are many.

1. The abolition of the present system of using the streets as latrines : insisting that all should use either their private latrines (which ought to be kept clean) or the public latrines. The present latrines are badly constructed and ought to be demolished. They are seldom, if ever, kept clean, and I am informed that the cattle are the scavengers ; considering that most of the animals supply milk for the use of the people, the idea that they are partly fed on human excrement is too disgusting for words.

2. The roads are badly constructed, narrow, and sandy. I doubt if there is a good road in the whole city. There ought to be several broad roads made in the city from the various gates, so as to allow of free ventilation. These roads must be properly constructed. I would make a broad properly-constructed road, say, of about 20 feet in width, round the inside of the city walls. The houses at present in many instances are right up to the walls. I am aware that this is being attended to, and that many are coming down ; but I would recommend a broad road which would be a means of ventilating the city and preventing people using these places as latrines.

3. There are no drains to carry off the surface-water during the rains ; the consequence being that the whole of the streets are one mass of mud. Drainage of the city could be very easily carried out by a competent Engineer, considering the nature of the ground.

4. The city walls are an obstruction to air. They might certainly be reduced to half of their height, and the material used for paving the roads. I think if several gateways of moderate size were constructed in these walls and grated with iron bars so as to allow only of the entrance of air, it would be a great improvement.

5. The houses are in most, if not in all, instances badly ventilated. High stone walls enclose the court-yard surrounded by rooms. This court-yard is used as a stable for cattle and not kept clean. The rooms are crowded, dark, and gloomy. They should have more windows to allow of light and air, and the high walls and gate-ways either removed or brought to a reasonable height. Some of the lower rooms are below the ground level, and I should think, in the rains, are very damp.

6. The cattle are at present stabled in the city. This must be put a stop to in every case. Means are now being taken to make the Gowlees keep their cattle outside the city walls, and a place has been selected for them. But no cattle, even of private owners, should be allowed inside the city walls, and a fine should be levied on those breaking this rule. Cattle at present are found infesting nearly every road, and so are the dogs, which lie about the roads utterly regardless of passers-by. The numbers of these latter animals might very conveniently be diminished.

7. The fish and meat market must be outside the city, considering the densely overcrowded condition it is in. The spot for this market has already been selected by Mr. Pestonji and myself outside the Sonawalla Gate.

8. The oil-mills, of which there are about 50, ought to be outside the city walls. They are very insanitary as at present conducted. A site for these has also been selected outside the city. The houses at present used as oil-mills ought to be thoroughly cleansed or demolished, and air space allowed. The city is very much overcrowded, and air spaces badly required.

9. I should urge that a competent European Engineer and Medical Officer be resident at Cutch-Mandvi to see that these and other improvements they consider necessary be properly carried out. An Engineer might give advice as to the silting up by sand of the western parts of the city walls, and its prevention; the construction of proper roads through the city, and of gutters to remove the surface-water; construction of proper permanent latrines; a proper water-supply for the city. The present water-supply is very inferior in quality, and the only good drinking water is obtained from a long distance; well water is used, and the people suffer from intestinal worms to a great degree; in fact, nearly every patient suffered from them. There are many other points in which the presence of an Engineer would be advisable. As for the presence of a Medical Officer, considering the severe nature of the epidemic, the present very insanitary condition of the town and its dense overcrowding, considering also that this large town is in direct communication with Bombay, Karachi, and many other ports, and its inhabitants are traders in nearly every city in the Presidency, it is of vital importance that every sanitary measure be taken to ensure its purification, and a careful watch ought to be kept on the health of the city to enable this to be done.

10. A proper system of registration of deaths ought to be kept, and every means used to see that no cases of deaths are smuggled away to the burial and burning grounds without being properly certified. In a town, a square mile in area, with high walls all round it and the gate-ways where the dead must be removed through, it cannot be very difficult to have this carried out. I would further advise that the Medical Officer and Engineer be members of the Municipal Board.

11. The burial grounds for the Muhomedans ought to be far away. At present they are a source of great danger, as they encroach on the town, especially in the case of Salaya, where there is a very large cemetery quite near the village. The river ghât burning ground might be removed further; at present it is much too near the bridge over the river, and is anything but a pleasant sight. There is a large number of burial grounds around the city.

12. An Engineer might advise on the removal of quite a number of badly-constructed houses inhabited by meghiwars, brickmakers, &c., on the outside of the city walls, and select sites where they may have built for them proper houses. There are some thirteen small blocks of houses built of wood on piles facing the Post Office and along the bank of the river. These are unsightly and ought to be removed as they face good substantial stone houses on the river bank.

13. Brickmakers also ply their trade by the side of the main road to the bridge, and the smoke from their kilns is a great nuisance; some other site may be given them for making bricks. Near the same place, but in the river bed, there is another nuisance, viz., the soaking of bamboos in some substance which gives a very unpleasant odour of rotten eggs; this smell greets one also when going along the main road, and might with convenience be removed elsewhere.

14. At present I propose having four municipal carts which could carry away the filth from the latrines to the sea in the west of the town about a mile away, and at high tide empty the contents into the sea. An Engineer and Medical Officer may think of some other better plan later on.

The following villages around Mandvi have been, and are to some extent still affected : —

Goora	...	...	...	...	...	4 cases.
Maska	...	...	...	...	...	66 "
Goondiali	...	...	...	...	...	119 "
Doorgapur	...	...	...	...	...	5 "
Nana Bhadia	...	...	...	...	...	9 "
Tanwana	...	...	...	...	...	3 "
Meren ...	...	...	...	...	...	14 "
Khatheda	...	...	...	...	...	60 "
Kodag	...	...	...	...	...	1 case.
Bade ...	...	...	...	...	...	26 cases.
Bidade	...	...	...	...	...	2 "

These villages near have been visited and means taken to have the sick isolated and the houses whitewashed, and, where it was possible, medical aid was sent to them.

At present the plague is in about three villages, two of them (Maska and Goondiali) within a few miles of Cutch-Mandvi.

Climate and General Remarks.—The climate during the time that we were here, viz., from the end of April to the beginning of July, was very pleasant compared with that of Bombay. The temperature during the day was generally pleasant and cool, and nights were always cool. A strong westerly wind blew straight from the sea and made the air rather humid. We had about three or four days of dry inland breeze with a temperature about 95° F. about the first week in June, but it lasted only a very short time during the day, and was soon followed by a cool sea-breeze. No rain fell during the time, except a very slight drizzle on the 2nd July, which soon passed off. We had many cloudy days, with, sometimes, a fog in the morning.

I enclose a chart of the mortality, which is interesting. From this it will be seen that the disease was evidently at its height when we arrived here and reached its maximum about the first week in May. The mortality for May was 2,792, or a daily average of 90 a day; and the mortality for June was 472, or a daily average of nearly 16—a great difference between the two months. The disease ran eight or nine weeks before the normal death-rate was reached. The total mortality, as shown by the chart, from 24th April to 30th June is 3,872, but there were a great many cases which died before we came here or any registration established. I think that, if the mortality from early in March to the end of June was placed at 6,000, the estimate would be correct. The type of the disease was very virulent in nature; a great number dying before any bubonic symptoms were established, as it seemed from their intoxication with the poison. And as the disease declined in virulence, the patients had a better chance, and the mortality seemed lower. Even towards the end of the epidemic a few cases of the virulent type were occasionally seen. Surgeon-Captain Mason, who had sole medical charge of the wards, and who took a very great and intelligent interest

in this disease, will give his opinion on its clinical aspect. On seeing the chart, which, I think, gives a fairly correct return of the deaths, it will be at once seen that the disease made steady downward course every week. If you ask me what it was due to, I cannot give you an answer, save that every effort was made to combat the disease—segregation, isolation, sanitation, and hospital treatment. Perhaps all these had a hand in it; or, as some think, the disease had reached its climax and declined of its own accord, having expended its virulence and demanded its victims. At all events, the city was cleaned up and the sick removed, and those who could be persuaded removed to fresh air and light out in the open gardens.

• The city gates were guarded in the first week in May, and it was not till the last week or so in June that people from outside were allowed in the city. At present the place is filling fast, and the mortality fortunately keeps low. Precautions are, however, taken to clean and whitewash all houses where deaths take place even now, and search parties are still alert. The greatest precaution, however, ought to be taken about keeping the city clean and not fouled by being used as a latrine. To obviate this, I have already built one latrine outside the city walls, and others are being constructed. We have been obliged, owing to the overcrowded nature of the place, to select two sites in the heart of the city where latrines could be built to relieve the congestion there. I would again strongly condemn the liberty which cattle and dogs have of entering and roaming about the city. It is no place for them, nor are they to be allowed as scavengers.

In conclusion, I think every praise is due by the State and people to Major Hyde Oates for the prompt way in which he grasped the situation and obtained help for the city, and I owe him many thanks for the help which he gave me in sanctioning every requisite that was considered necessary, and sparing no trouble in obtaining them for me. He was the first on the field and saw the epidemic to its close.

In Mr. Pestonji Sorabji, the State possesses a man of sound, practical common sense. He was here throughout the epidemic, and kept his head in what must have been a very trying time, indeed, to him. I obtained every help from him, and he kept all the other State Officials up to their work, so that there was no hitch in the carrying on whatever work was required, and by his genial and kindly measures smoothed over all difficulties which cropped up.

As for Surgeon-Captain Mason, Dr. Shroff, Mrs. Remy and her staff of excellent nurses, and the subordinates, I cannot say less than that, if the proof of a work is its result, the result here fully justifies every praise to them for their hearty co-operation in every measure taken in hand. On Dr. Mason's work, I shall have much pleasure in reporting more fully; the Service possesses in him a very zealous and painstaking officer.

The work of the nurses was of a trying character, and it was more so when Nurse Remy and the other nurses who came here at first took the nursing in hand, as the number of patients was very large and a great tax on their powers. For all that, they never relaxed their duties, but, by the conscientious performance of their arduous work and their gentle manners, combined with a thorough knowledge of their duties, won the confidence and affection of all the sick. Those who know the constant demands which plague cases entail on the attendants must feel that, when short-handed, the demand on patience and endurance is very heavy; but I am glad to say that in no instance have I heard that the sick were treated except with uniform kindness and gentleness. The nurses, one and all, deserve the thanks of the State and the gratitude of the sick.

In Mr. Atts, the Inspector of Bombay Coolies, the State obtained the services of a most tried and experienced official. His duties were of the most arduous character, having to be out in the city all day and amongst very insanitary and dangerous surroundings, and for the most part of the time single-handed. His report quoted in its place shows the amount of work he has done. His experience was also utilised in the construction of temporary latrines which he has designed and made up.

The following is the list of the medical and nursing staff employed :—

Medical Staff.

Surg.-Lt.-Col. J. S. Wilkins, I.M.S.	Dr. R. M. Nanji.
Surg.-Capt. H. Dempster Mason, A.M.S.	Mrs. A. VanIngen, M.D.
Dr. K. B. Shroff.	

Nurses.

Mrs. Remy, Senior Nurse.	Mrs. Pinsent.	
" Nesbitt.	" Barnes.	
Miss Horne, died May 6th, 1897.	" Goulden.	
Mrs. Lys (resigned).	Miss Mitchell.	
Miss Madden.	" Briggs.	
" Neroy.	" Franklin.	} Attached to the Jiraj Peer- bhai Khoja Memon Private Hospital.
" Katsch.	" Orum	
" Jones.	" Steele	

Hospital Assistants.

Gopinath Yeshwant.	Rajendra Pillay.
Rajaram Shivram.	Sayaji Shivaji.

Assistants.

Chunilal Narotamdas.	Palkhiwalla.
Bhutt.	

Students.

Rajaballi.	Mutkekar.
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The following notes have been compiled from personal observation of over 1,200 cases in hospital, and a very large number outside, by Surg.-Captain H. Dempster Mason, A.M.S.

PLAGUE La Peste (BLACK DEATH).

From a fair amount of evidence obtainable from different sources, it is highly probable that the earliest manifestation of this disease occurred at the end of February 1897; that the patient had been brought by sea from the infected neighbouring port of Karachi, and, owing to the feeble attempts at quarantine, was permitted to be nursed in the segregation hut by relatives living in the village of Muska. Naturally enough, plague then broke out in the house of the relatives, whence it spread to the town of Mandvie and all the villages in the immediate vicinity.

Having once established itself, the disease found every condition favourable, not only for its existence, but for its rapid development in the most virulent form.

Local conditions.

The conditions chiefly affecting its propagation are: a warm and humid atmosphere, the people living in marshy soil on the sea-coast and creeks; low, badly-ventilated and overcrowded houses; great accumulation of putrefying animal and vegetable matter in the vicinity of the dwellings; the most revolting filthiness in personal habits, and the whole city little better than one large latrine, in such an insanitary state that it requires to be seen to be believed. This condition appears, on inquiry, to be such as might have been anticipated where no organised system of scavenging had existed for centuries.

The relations between the sick and healthy undoubtedly exercise a most important influence on the propagation and extension of the disease. In the absence of quarantine, perfectly free intercourse existed between the healthy and the sick, and it has been noticed that persons living in the same house with the sick are peculiarly liable to suffer, whilst those brought only into occasional contacts are not so likely to become infected. This observation has been well illustrated in the various hospitals where there has been a large staff employed in doctoring, nursing, and other duties of an occasional character. Out of this number there have been two cases of plague—one an orderly and the other an ayah. There is no doubt that the disease is "caught" from the sick by the healthy brought into association with them; in other words, it is contagious; this expresses the wider meaning of the term which includes the process direct, or intermediate, of conveying its bacillus from the sick to the healthy.

Contagious nature of the disease.

There are several means of conveyance:—

1. By the air, producing the very common and fatal form of *primary plague pneumonia*.
2. By the food or drink (*acute plague—dysentery*.)
3. By the skin.

I am inclined to think that the latter method is far commoner than is generally supposed, especially amongst the cases affected with buboes. Out of the following 260 cases of patients dying with buboes, it has been found that there were—

No buboes	...	...	...	...	...	94
Right inguinal	...	...	...	...	...	60
Left "	...	...	...	...	...	58
Right axillary	...	...	...	...	...	19
Left "	...	...	...	...	...	11
Submaxillary	...	...	...	...	...	7
Cervical	...	...	...	...	...	1
Supratrochlear	...	...	...	...	...	1
Parotid...	...	...	...	...	...	1
Multiple	...	...	...	...	...	8

From the above it will be seen that by far the largest number of buboes affected the groin. The explanation of this appears to be, that the large majority of Outchees wear no protection to the feet, and it is perfectly easy to understand that, under these circumstances, even so slight an abrasion of the superficial epithelium (an unavoidable occurrence in a barefooted race) would provide a mode of entrance to the bacillus followed by an inflammatory condition of the nearest glands.

The same principle applies equally to other parts of the body. The next largest number to the inguinal are the axillary, the right axillary nearly double the left, because the right hand is not only used more than the left, but is almost exclusively used in eating.

The submaxillary becomes infected by the entrance of the bacillus through a carious tooth, the supratrochlear from the hand, and the parotid through Stenson's Duct. The cases fairly illustrate the frequency of direct inoculation, which in the present state of our knowledge should come under the old head of contagion.

Of other means of indirect contagion there appears to be some evidence of the transmission of the disease by the agency of clothes and bedding which have been used by the sick, but the main point in connection with the liability of the healthy to contract the disease seems to be dependent on the intimacy and regularity of communication with the sick.

Seasonal changes.

Both the local conditions and the conditions affecting the healthy and sick appear to be modified by seasonal changes, commencing in the cool weather of February, attaining its height in May, the epidemic commenced to decline with the decline of the hot season in June.

Incubation.

It seems next to impossible to furnish any precise data with respect to the actual period of incubation, but there has been sufficient evidence to indicate that in the large majority of cases it is short. *Assuming the theory of direct inoculation to be correct, it is probable that the period varies from a few hours to one or two days. By other methods it may extend to a maximum of eight days, and the average might be set down at five.

Symptoms.

Perhaps the most striking point in connection with the symptoms of the disease is that the onset and progress differ enormously in different cases. Most commonly after a period of lassitude, headache, aching in the limbs and loins, the fever commences, and either concurrently with this or from the second to the fourth day, tenderness followed by buboes in the groins, axillæ, or angles of the jaws. The febrile condition is usually acute in the early stages, often accompanied by severe headache, and in the worst cases by delirium and stupor. In some of these latter the whole toxic effect of the disease seems to localise itself in the central nervous system, producing the gravest symptoms—the suffused conjunctivæ, the hesitating drunken speech, the inability to comprehend or answer questions, the feeble pulse, the extreme prostration—all marked indications of the severity of the attack. In less grave conditions the tongue is white and thickly coated, the teeth and gums covered with sordes, and the thirst intense. The swelling of the glands increases and is accompanied by tenderness, sometimes followed by acute pain. In several cases a condition has been noted in which no gland could be detected, but a thick puffy cedematous condition of the skin over the situation of the gland in the axillæ especially, which rapidly spreads to the adjoining parts, in one case extending on the right side over the whole of the chest as low as the last rib, across the front of the chest to the tip of the left shoulder, and over the right shoulder into the neck as high as the lower jaw. All these cases proved rapidly fatal. The pulse runs quickly up to 120 to 130. The temperature varies from 102° in mild, to 107° in the severest, form. The end of the fever is commonly marked by a sudden fall of temperature often as low as 97° or 98° F. In the early stages nausea and bilious vomiting are very common. The urine commonly contains albumen, and there have been several cases of retention, and two of complete suppression. In the later stages the fæces are passed involuntarily.

Phlegmonous condition of the skin.

Local signs.

Of the local signs the appearance of buboes, or rather tenderness, not infrequently precedes the symptoms of general disturbance. In some cases they are first observed within twelve hours after the fever has set in; in other and more numerous cases they show themselves on the second, third and fourth day of the attack. The enlarged glands forming buboes are rarely numerous (*vide* Statistics), and of a group only one is, as a rule, enlarged, attaining the size of a cocoon, whilst others are but little enlarged. Suppuration rarely occurs in fatal cases, the toxic poison seldom admitting of sufficient time to reach that stage.

Petechiæ distributed generally over the body are often observed usually preceding a fatal issue.

Necrosis of skin.

Pustules commencing as sanguinous bubo varying in size from a nut to a hen's egg, followed by suppuration and necrosis of skin.

Physiognomy.

Plague has a special physiognomy, having nothing in common with other diseases. The eyes are suffused and retracted within the orbits, the aspect is haggard and

expresses apathy, the patient looks stupefied as if intoxicated and does not readily answer questions, but one is not struck with the gravity of the condition or the danger to life. Even the worst cases are apt to deceive the inexperienced, and make him believe the case to be free from danger, when, in reality, it has only a few hours to live. How many cases can one call to mind of fine robust patients in this condition in the morning found dead at the evening visit. There is still another class of patient met with chiefly at the beginning of the epidemic, but also in the middle and at the end, who are suddenly stricken down with illness and die in a few hours, without any of the external characteristic manifestations of the disease, the amount of the toxin produced by the bacilli being so great that the central nervous system is completely overwhelmed and its function arrested. It is in cases intermediate between the latter and an attack of ordinary intensity, that the symptom of aphasia is so commonly observed. Curiously, the histories of these cases have been precisely the same: high temperature; the attack chiefly localised in the nervous system; delirium lasting a variable time usually short, followed by sometimes complete loss of power to produce any sound (aphonia), or more often, whilst consciousness remains intact, there is complete loss of power to convert thoughts into words. Fortunately the majority of these cases recover the lost power rapidly, the thickened disjointed guttural attempt at speech indicating the first favourable sign. In association with this condition in several cases there has been marked ataxia shown by the feeble grip, the inability to perform purposive co-ordinate movements either with the hands or arms or legs; this also clears up rapidly as recovery advances. During the later stages of the disease there has been one well-marked case of right hemiplegia. In these latter cases, buboes have not been a conspicuous symptom. Lastly, after the epidemic had reached its height, pulmonary disturbance has been the most predominating and fatal feature. It takes the form of catarrhal pneumonia, and may be either primary or secondary; the primary form and the attack localised in the central nervous system have been by far the most fatal symptoms developed. Not a single case of primary pneumonia has recovered, and so far the same may be said of the secondary form. Conjunctivitis has also been a frequent symptom, starting as a simple suffusion of the conjunctivæ followed by corneal ulcers, panophthalmitis, and often leading to destruction of one or both eyes.

Plague is a disease marked by a very protracted convalescence; during this period complications of the most varied description are likely to develop.

The most frequent are—

- (a) Sloughing of glands entire, with the skin over them.
- (b) Multiple synovitis, sometimes leading to suppuration. This condition in the early stages has many symptoms in common with acute rheumatism, later it becomes localised in the joints, chiefly wrists, ankles, knees, and elbows, and may be followed by suppuration. In one case the left knee-joint alone was affected.
- (c) Secondary pneumonia.
- (d) Conjunctivitis, corneal ulcers, panophthalmitis.
- (e) Pareses and paralysis, aphonia, aphasia, hemiplegia, imbecility.
- (f) Thrombosis.
- (g) Retention of urine.
- (h) Suppression.
- (i) Pyæmia.

There is apparently no other idiopathic fever attacking a large number of people at the same time, which is characterised by glandular swellings and by those grave symptoms of the nervous blood and biliary systems which show themselves in an

attack of plague. Plague concurrent with malaria. Concurrent attacks of plague and malaria [as shown by the discovery of Laveran's body (Amœboid)] have been noted in which the malaria confers a distinct periodicity on the temperature of plague (*vide* Temperature Chart).

Prognosis.

All cases complicated with (1) primary pneumonia, (2) extensive œdematous condition of skin over seat of buboes, (3) all cases in which the attack centralises itself from the first in the nervous system and fatally, whilst rapid suppuration of buboes is looked upon as a favourable symptom.

Of five cases of abortion from plague, not one has recovered.

The prognosis is better in children than men and in men than women; of 260 deaths in the Brahmapuri Hospital (Hindoo) there have been—

Males	...	...	...	...	89
Females	...	...	...	...	146
Children under (10)	...	...	...	...	25

whilst from deaths, 3,516, from all hospitals, there have been—

Males	...	...	...	...	1,226
Females	...	...	...	...	1,727
Children	...	...	...	...	563

The high rate of mortality among females may be partially accounted for, *first*, by the fact that large numbers of the Hindoo men inhabiting the city are merchants and extensive travellers by sea, *second*, a much larger number with the chivalry common to the native mind, on the outbreak of the epidemic, fled the city, panic-stricken, leaving their wives, children, and belongings to forage for themselves. The healthy and robust appear not only to prove to contract the disease, but to suffer from the most virulent forms and die in as great a proportion as those of weaklier frame and weaker constitution.

Mortality.

The mortality appears to have differed among the various castes and at different phases of the epidemic.

Of the first 100 recorded cases in the Brahmapuri Hospital (Hindoo), the mortality was 90 per cent.

Of 100 cases recorded from the same source a month later, the mortality was 83 „

Amongst the Borah community from 7th April to 11th June (Hajira Hospital), the mortality was 45 „

General Mahomedan Hospital 61 „

Khatri and Mahomedan Hospital 36 „

Khoja Hospital 13 „

From the above statistics, it will be seen that the Hindus suffered by far the worst; but considering the ghastly conditions of their existence, the terrible overcrowding in low, badly-built, badly-ventilated and worse-lighted houses, the total absence of drainage, and the most degrading personal filth, the only marvel is that the whole population has not been annihilated.

That the mortality has been seriously aggravated by the lamentable ignorance and obstinacy of all castes in refusing to bring their sick early to hospital, no one can for a moment doubt; large numbers of cases have been admitted moribund, or have died within a few hours. Many have been admitted in the most loathsome condition, one poor wretch having suffered such frightful neglect that the whole of an enormous cervical bubo extending from the left ear to the sterno-clavicular joint was found on admission to be filled with living maggots. Children brought in with perforated corneal ulcers. Men with enormous sloughing glands, and all the horrors of the later stages indicated their set resolution that no patient, however ill, should be brought to hospital until his condition was thought by his relatives to be hopeless if kept at home.

The same cannot be said of the Borah community, for, on the outbreak of the epidemic, the whole sect was taken in hand by the headman and removed into segregation huts outside the city and there kept in insolation. This and the fact that 571 out of a community of 1,500 were inoculated with Yersin's preventive serum undoubtedly account for the low rate of mortality.

To the Khatri and Khoja castes, both numerically small, to a large extent the same remarks apply.

The mortality also varies considerably with the day of the disease on which the patient is admitted.

Of 100 non-inoculated cases from the Brahmapuri Hospital, from May 25th to June 2nd, admitted—

First day ...	...	...	82 per cent. died.
Second „ ...	...	...	66 „ „
Third „ ...	...	...	95 „ „

Thus the third day is far the most fatal, and this experience has been endorsed at all the other hospitals.

The general Mahomedan Hospital received patients from the city and the village of Salaya where the sea-faring community exists, under much the same conditions as the Hindoos in the city, except that there is less overcrowding, more light, and air.

Treatment—

Treatment.

(a) *Preventive.*

(b) *Curative.*

(a) Preventive methods consist chiefly in removal of the conditions which favour the development of the disease and, having become established, the limitation of its spread.

The conditions favourable to the development of plague have already been enumerated:

With regard to the limitation of its spread, the chief considerations are—

- (a) *Isolation* of the sick under the best circumstances.
- (b) *Disinfection* of all articles of clothing or bedding used by the patient and of the house in which he has lived.
- (c) *Preventive inoculation* of serum antipesteux prepared by the Pasteur Institute.

On account of the brief period of immunity conveyed by the usual dose of 10 cc., it is extremely difficult to prove the value of this method of treatment.

It has not been found possible to inoculate whole communities (every ten days). The communities object, in which case it is not accurate to ascribe the absence of plague to the immunising effect of the serum; nevertheless, it is an extraordinary fact that, out of 721 persons who have been inoculated once only, up to the present not a single case of plague has developed. These cases have all been registered and are composed of different castes living in different places.

Men of Borah community ...	...	...	...	380
Children „ „ ...	...	...	...	191
Men, women and children of Muska village ...	...	...	...	110
Men, women and children of Bada village (16 miles from Mandvi) ...	...	...	...	40

It also seems clear that immunisation conveyed by the preventive serum becomes rapidly less from tenth day to the twentieth day, when it may be said to be exhausted. Sepoy Jayanak Tuluak, who died from plague, had been inoculated 20 days previously to the attack.

(b) *Curative*—(a) General, (b) Special.

* As no specific has hitherto been discovered for the cure of plague, the treatment resolves itself into the carrying out of the general principles of medicine as applied to the treatment of symptoms arising in the course of the disease. *

The stimulant method and the administration of liq. hydrargyri perchloridæ have both been given the fullest trial, and both have proved equally inefficacious in either controlling or checking the disease.

In order to arrive at some definite conclusion as to the value of the various methods of treatment, and especially to compare the results of the general, in contrast to the special, treatment by inoculation of serum antipesteux, I have collected 100 cases which were admitted to hospital between the first and the fourth day of the disease, and treated by the usual methods, and I had hoped to have been able to collect 100 cases of patients treated by inoculation, admitted under exactly the same conditions as those of the first hundred, but the lack of serum at the critical time has rendered this difficult to accomplish.

Appended is a list of 30 cases inoculated, and nearly 100 cases non-inoculated.

The mortality in the former is 60 per cent., in the latter 83 per cent., that is to say, a saving of life of 23 per cent.; and, although this is not as good a result as I had at one time anticipated, it is sufficient to indicate the right path and to act as a further stimulus in perfecting the only means we have at present of even influencing one of the direst diseases that ever afflicted humanity.

With regard to the action of the serum itself by reason of the irregularity of the temperature curves in plague, it is very difficult to determine exactly the modification which the administration of serum produces on these curves.

It is absolutely certain that in ordinary cases the temperature falls under the action of the first injection, that is to say, in the first 24 hours, and it is equally certain in many cases that it never re-ascends.

This fall is obtained whatever the day of the disease on which the treatment is commenced, unless the patient is moribund.

The fall in temperature is generally temporary even in those about to recover.

The most characteristic actions of serum (in cases of ordinary gravity) inoculated in the earliest stages of the disease are : (a) fall in temperature, (b) amelioration of the general condition, (c) diminution of stupor, (d) improvement in prostration.

The improvement in the general condition like the fall in temperature is in the majority of the gravest cases transitory, the symptoms again become serious, and the disease appears to run its course as if the serum had not been given.

The alteration brought about by the serum exercises an influence which is prolonged over the temporary improvement noticeable after the inoculation.

In cases treated early from the first to the second day, the progress of the disease and the intensity of the symptoms are diminished.

When the first re-action of the serum is exhausted, the fever returns with less virulence, and there is generally less stupor than before the commencement of the treatment.

In cases which appear certain to die, the course of the disease seems to be stayed, and even, if recovery does not take place, it nevertheless provides a most powerful resistance to the disease and one which may last a considerable time.

The decided action of the serum is proved in all cases where the patient does not die within 24 hours (which is an indispensable condition, in order that the serum may have time to act). I therefore submit that, if the treatment by serum is ineffective in a certain number of cases, it has an enormous power over those cases where the toxin poisoning is not the gravest and where the disease does not run its most rapid course. In the majority of these cases, we are bound to admit that the recovery is due to the serum.

Illustrated temperature charts are appended.

Cases of Plague inoculated at Brahmapuri Hospital admitted between 1st and 4th day of the Disease.

Name.	Sex.	Age.	Admitted to Hospital.	How long ill when injected.	Total quantity injected.	Result.	Bubo.	REMARKS.
Nurey Jiva	Male	9	30th May 1897.	4 days	90 c. c. ...	Discharged cured ...	Parotid L. & L. C.	
Jaynak	"	25	"	"	100 c. c. ...	Died 4th June 1897 ...	Right axilla.	
Ramabai	Female	15	1st June	1 day	120 c. c. ...	Died 3rd June 1897 ...	Do.	
Sirjee	Male	8	"	2 days	150 c. c. ...	Died 11th June 1897 ...	Right inguinal and femoral	
Godavribai	Female	32	2nd June	"	220 c. c. ...	Discharged cured, 11th June 1897.	Right groin, Pusatile left foot	
Bhatubai	"	13	"	4 days	190 c. c. ...	Died 6th June 1891...	Left femoral. Right & left feet swollen and right & left cervical.	
Hirji	Male	8	"	1 day	50 c. c. ...	Died 4th June 1897...	Left axilla.	
Mateobai	Female	40	3rd June	2 days	140 c. c. ...	Died 5th June 1897...	Left femoral.	
Rattobai	"	45	4th June	"	170 c. c. ...	Died 11th June 1897	Right groin.	
Rattambai	"	29	"	"	200 c. c. ...	Died 23rd June 1897	Left femoral. Pneumonia.	
Godavribai	"	30	"	1 day	160 c. c. ...	Discharged cured, 11th June 1897.	Left groin. Nil.	
Kankobai	"	20	"	"	160 c. c. ...	Discharged cured ...	Left femoral.	
Mambai	"	40	"	"	140 c. c. ...	Died 9th June 1897...	Left femoral. Nil.	
Kareo	Male	40	"	2 days	230 c. c. ...	Died 8th June 1897...	Right inguinal. Suppression of urine.	
Dhanaswar...	"	45	5th June	"	170 c. c. ...	Died 9th June 1897...	Right inguinal. Suppression of urine.	
Sunbai	Female	28	6th June	"	230 c. c. ...	Died 13th June 1897	Right groin.	
Janki	"	25	7th June	3 days	140 c. c. ...	Died 11th June 1897	Left groin.	
Rambabai	"	60	9th June	"	120 c. c. ...	Died 12th June 1897	Right axilla.	
Narsh Valji	Male	45	"	1 day	270 c. c. ...	Discharged, 23rd June 1897	Pneumonia.	
Rattubai	Female	21	11th June	3 days	90 c. c. ...	Died 14th June 1897	Right groin. Nil.	
Rambabai	"	30	15th June	"	90 c. c. ...	Discharged ...	Right groin.	
Jeyambai	"	40	20th June	4 days	110 c. c. ...	Discharged cured ...	Do.	
Pedambai	"	10	"	3 days	100 c. c. ...	Do.	Do.	
Jans Persia	"	33	22nd June	1 day	150 c. c. ...	Died 23rd June 1897	Left submaxillary.	
Komalbai	"	45	"	2 days	120 c. c. ...	Died 24th June 1897	Left groin.	
Sumer	Male	11	24th June	4 days	100 c. c. ...	Discharged cured, 19th June 1897.	Right groin.	
Abao	"	55	23rd June	1 day	130 c. c. ...	Died 28th June 1897	Left groin.	
Shurji	"	50	"	"	90 c. c. ...	Discharged cured ...	Do.	
Rambabai	Female	18	19th June	2 days	140 c. c. ...	Do.	Do.	
Havabai	"	17	"	"	110 c. c. ...	Do.	Do.	

Cases admitted between 1st and 4th days (4 after or unknown.)

No.	Name.	Sex.	Age.	How long ill.	Admitted to Hospital.	Buboes.	Result.
1	Mohanji ...	Male ...	30	2 days	1897. 25th May ...	Nil	Died.
2	Lalji ...	" ...	27	Very old case	" ...	"	"
3	Cooverji ...	" ...	35	4 days	" ...	Left groin	"
4	Khimji ...	" ...	50	2 "	" ...	Right groin	"
5	Shambai ...	Female.	18	2 "	" ...	Nil	"
6	Panabai ...	" ...	"	Not known...	" ...	"	"
7	Vishnubai ...	" ...	50	3 days	" ...	"	"
8	Moonjibai ...	" ...	30	Nil	" ...	"	"
9	Premjibai ...	" ...	18	2 "	" ...	"	"
10	Ratanashi ...	Male ...	20	2 days	" ...	"	"
11	Soonderbai ...	Female.	70	2 "	" ...	"	"
12	Dhanbai ...	" ...	52	2 "	" ...	Left axilla	"
13	Nanbai ...	" ...	30	3 "	26th May ...	Left groin	"
14	Dharamshi ...	Male ...	70	3 "	" ...	Nil	"
15	Sambai ...	Female.	35	4 "	" ...	"	"
16	Dahya ...	Male ...	25	3 "	" ...	"	"
17	Harjiwan ...	" ...	55	3 "	" ...	"	"
18	Pritambai ...	Female	60	3 "	" ...	"	"
19	Kashibai ...	" ...	28	2 "	" ...	Left groin	Discharged.
20	Gangubai ...	" ...	40	3 "	" ...	axilla	Died.
21	Joshi Manji ...	Male ...	50	2 "	" ...	"	"
22	Gombai ...	Female.	10	2 "	" ...	parotid	Discharged.
23	Poonja ...	Male ...	35	3 "	" ...	"	Died.
24	Sungai ...	" ...	20	2 "	" ...	Left axilla	"
25	Velji ...	" ...	30	4 "	" ...	Right axilla	"
26	Lakanbai ...	Female.	32	3 "	" ...	"	"
27	Lalji ...	Male ...	19	3 "	" ...	"	Discharged.
28	Govan Khimji ...	" ...	60	2 "	27th May ...	Left groin, small.	Died.
29	Meghji Premji ...	" ...	30	2 "	" ...	Right axilla	"
30	Lohanjibai ...	Female.	16	3 "	" ...	Nil	"
31	Velbai Rambai ...	" ...	13	2 "	" ...	Right axilla	Discharged.
32	Vhalibai ...	" ...	14	2 "	" ...	parotid	Died.
33	Mithoochai ...	" ...	30	2 "	" ...	Nil	"
34	Pragji ...	Male ...	18	2 "	" ...	Right groin	"
35	Mooli ...	Female.	15	4 "	" ...	"	Discharged.
36	Meethi ...	" ...	20	4 "	" ...	axilla	Died.
37	Velibai ...	" ...	33	1 day	" ...	groin	Discharged.
38	Gomatibai ...	" ...	40	2 days	28th May ...	"	Died.
39	Vamanji ...	Male ...	30	2 "	" ...	axilla	"
40	Manekbai ...	Female.	25	2 "	" ...	groin	"
41	Ramanbai ...	" ...	30	2 "	" ...	"	"
42	Hiroobai ...	" ...	6	2 "	" ...	"	"
43	Nanji ...	Male ...	6	2 "	" ...	"	"
44	Dharai ...	" ...	14	6 "	" ...	Pneumonia	"
45	Manbai ...	Female.	4	2 "	" ...	Right groin	"
46	Velji ...	Male ...	10	3 "	" ...	"	"
47	Ranoo ...	" ...	25	4 "	" ...	"	"
48	Jetha ...	" ...	25	2 "	" ...	"	"
49	Vithai ...	Female.	18	1 day	" ...	Left groin	"
50	Gomatibai ...	" ...	50	1 "	" ...	Nil	"
51	Loobibai ...	" ...	35	1 "	" ...	Right groin	Discharged.
52	Naran ...	Male ...	45	2 days	" ...	Nil	Died.
53	Katibai ...	Female.	30	2 "	" ...	Right axilla	"
54	Charapanbai ...	" ...	25	4 "	" ...	inguinal...	Discharged.

No.	Name.	Sex.	Age.	How long ill.	Admitted to Hospital.	Buboes.	Result.
1897.							
55	Khimji ...	Male ...	60	4 days	28th May ...	Right groin	Died.
56	Hansibai ...	Female.	18	6 "	"	"	"
57	Kalianji ...	Male ...	21	3 "	"	Left groin	"
58	Panchibai ...	Female.	13	1 day	"	"	"
59	Gangabai ...	"	28	2 days	"	Right groin	Discharged.
60	Kanji ...	Male ...	10	1 day	29th May ...	" axilla	Died.
61	Pralimanbai...	Female.	5	4 days	"	" groin	"
62	Ramdass ..	Male ...	35	1 day	"	Maxillary	"
63	Parvatibai ...	Female.	30	1 "	"	Left groin	"
64	Kanji ...	Male ...	13	1 "	"	Right "	"
65	Wandubai ...	Female.	20	2 days	"	Left "	"
66	Manekbai ...	"	8	4 "	"	Right "	"
67	Champi ...	Male ...	22	3 "	"	"	"
68	Devkorebai ...	Female.	15	2 "	"	Left "	"
69	Dhyambai ...	"	23	3 "	"	"	"
70	Virji ...	Male ...	9	3 "	"	Right cervical	"
71	Manjibai ...	Female.	20	1 day	"	Left groin	"
72	Kalidas ...	Male ...	35	2 days	30th May ...	"	"
73	Amratibai ...	Female	50	4 "	"	Right & left groins	Discharged. *
74	Gangabai ...	"	...	1 day	"	Nil	Died.
75	Batanbai ...	"	42	2 days	"	"	"
76	Cooverbai ...	"	20	1 day	"	Left groin	"
77	Motibai ...	"	7	4 days	"	Tenderness, left groin.	"
78	Ladibai ...	"	40	2 "	"	Left groin	Discharged.
79	Manekbai ...	"	43	3 "	"	" axilla	Died.
80	Ramji ...	Male ...	41	2 "	"	" groin	Discharged.
81	Govindji ...	"	40	1 day	"	"	Died.
82	Samji ...	"	40	2 days	31st May ...	"	"
83	Moolibai ...	Female.	50	2 "	"	Nil	"
84	Hanaraj ...	Male ...	25	1 day	"	Left groin	"
85	Lakshmibai ...	Female.	14	2 days	"	" axilla	"
86	Metio ...	Male ...	6	2 "	"	" cervical	Discharged.
87	Ramji ...	"	8	1 day	"	" inguinal	"
88	Sivji ...	"	18	1 "	"	"	Died.
89	Motibai ...	Female.	25	3 days	"	" groin	"
90	Lilbai ...	"	20	1 day	"	Right "	"
91	Parthai ...	"	40	3 days	1st June ...	"	"
92	Karn ...	Male ...	20	3 "	"	"	"
93	Kanabai ...	Female.	70	2 "	"	Right cervical	Discharged.
94	Hirabai ...	"	25	3 "	"	"	Died.
95	Hadhubai ...	"	35	2 "	2nd June ...	" groin	"

Chapter XII.

CONCLUSION.

In conclusion, it is desirable to draw attention to a few points in connection with the spread, the existence and the extinction of the plague which have been drawn from personal observation during the time the Committee has been serving.

The disease appears to be both infectious and contagious ; it is exceedingly slow spreading, which enables its control if prompt action be taken, a point of the highest importance on an outbreak being observed. Even when apparently extinct, precautions must not be hastily relaxed, as its complete eradication is a matter of great difficulty. All medical opinions submitted to the Committee by the highest scientific representatives of each nation quite agree that the diplobacillus or the bacillus of Kitasato is the active virus of the disease, and that this microbe has peculiar properties by which it tends to develop and lurk under many various circumstances. Further investigations on this matter do not come within the scope of the Committee, but the consensus of opinion by the experts in Bombay assisted the Committee to arrive at conclusions as to the manner in which plague is spread.

Human agency has an undoubted and most powerful influence, both through the actual person of the plague-stricken, the infected room in which the patient lies, and through everything likely to harbour the microbes.

Amongst other sources of the spread of the disease throughout the epidemic, the influence of rats has been shown in many extraordinary ways. Grain depôts are often the first centres in the spread of the plague, the infection having been imported into the colony of rats that haunt the depôts, spreads amongst them, and they die in large numbers. In this way the grain and grain bags are infected and become sources of conveyance of the disease to human beings. The Committee have, during disinfection, invariably treated those places where rats have been known to die as plague-infected localities.

The following curious record is quoted as showing an early belief in a connection between outbreaks of plague and the disease in rats :—

On the occasion of the capture and detention of the Ark by the Philistines (I. Sam., ch. v.), their country was simultaneously attacked by a severe epidemic of what may very well have been a type of plague. One of the symptoms, at any rate, "emerods (hæmorrhoids) in their secret parts," may represent inguinal buboes. The mortality was extremely heavy. The complaint was epidemic, ravaging the cities and the mofussil—"fenced towns and country villages" (v. 18). It may also be noted that the Ark was *seven* months in the possession of the Philistines before, superstitiously attributing the plague to some supernatural vengeance or punishment, they turned it out of their country : and that if the general *life* of the plague be correctly presumed to be about *nine* months, then its disappearance *about* simultaneously with the dismissal of the Ark may support the suggestion that this particular epidemic was of the plague type. To this is to be added the singular coincidence that it was attended by either a plague or a great mortality of mice—"that mar the ground" (vi. 5). Lastly, it may be observed that the disease was plainly conveyed in the Ark and ox-cart to Bethshemesh, where inhabitants received it with acclamations and ceremonies. 50,000 of these are said to have died, and it was again superstitiously assumed that this was a punishment for having *looked into the Ark*. It is very possible that it was a consequence of handling the infected framework and hangings.

The disease in some of its types is probably spread by personal infection from clothes, bedding, or by smoking the same hooka, the mouth-piece of which is roughly dried (by possibly contaminated hands), as it is passed on from one smoker to the next. The Oriental habit of constantly cleaning all metal utensils in which food and drink are stored with earth or sand scraped from the midfloor, or from the roadways, which are often undescribably filthy, must likewise be a fruitful source of danger.

These and many other points taken in connection with the insanitary conditions in which the poorer, and in some particulars, even the wealthy, classes live, make the suppression of the epidemic in India a very difficult matter.

It must be remembered that in all large Oriental cities a very large proportion of the population are very poor and cannot afford to pay the rent of a really sanitary building ; they therefore are forced to live in miserable shanties, dark, low, small, and built on insanitary sites, without plinth, added to which, with a view to bringing the cost of this habitation to the lowest point, 16 or 20 persons will sleep, eat and cook in a space hardly sufficient for the requirements of four.

Orientals are most conservative, and are wedded to many insanitary customs which have been inseparably connected with their life and

religious prejudices for centuries. It is therefore no easy matter to avoid friction in enforcing the measures proved to be absolutely necessary in the elimination of plague, and in doing so, while the greatest firmness is desirable, every consideration must be given to the ignorant opposition of the masses to measures of which they fail to see the advantage.

The following steps however are, I consider, absolutely necessary to the suppression of the plague. Segregation of the sick out of their own dwelling houses, removal of all persons from the room in which the patient was seized or has been lying sick ; evacuation of the whole house if this is possible ; destruction of the clothing, bedding, &c., which has been in use by the patient ; the thorough disinfection of the house ; the thorough cleansing and flushing of all privies and bathing places ; the removal of portions of the roof where such obstruct sunlight and air entering the dwelling. It may be added that the prevention of overcrowding is of great importance. .

It is an interesting and highly satisfactory fact that remarkably few of the officers or employes engaged on plague work, and especially on disinfection, suffered from the disease. Of the coolies working within the City of Bombay who caught plague, only three or four are recorded ; of the gangs sent to Cutch Mandvi, five developed plague in the place itself and died, and three after they returned to Bombay while under observation. Of those sent to Colaba district, none are recorded as having taken the disease. But it is to be regretted that Dr. Desai, the Medical Officer in charge of the Hindu Hospital, and Dr. Davda, in charge of the Dariastan Hospital, succumbed to the disease while in the execution of their duty.

At Cutch Mandvi, Nurse Horne died after only a few days' illness, as did also Sister Elizabeth (Fille de la Croix) who nursed at the Government Hospital at Mahim. Two Hospital Assistants—one at the Jamsetjee Bunder and one at the Mahim Hospital—caught the disease ; the former died and the latter recovered. Three Military ward orderlies are recorded as having died of the disease contracted while engaged on hospital work.

It will be observed that the above number of casualties represent a very small proportion of the percentage of the total number of employes, and in that light the result of the precautions taken to prevent infection amongst the staff must be regarded as satisfactory. The Committee cannot conclude this report without acknowledging the support and assistance rendered throughout the time they have been sitting by the

Municipal Commissioner, Mr. P. C. H. Snow, the Joint Plague Commissioners, Surgeon-Major Reade and Dr. Lowson ; the Commissioner of Police, Mr. R. Vincent, his officers and men ; the Collector of Customs, Bombay, and the officers and men of the Preventive Service ; also by Mr. G. W. Roughton, A.-D.-C. to H. E. the Viceroy, who substantially helped the Committee in the formation of Mahomedan Hospitals ; the Health Department under Brigado-Surgeon-Lieutenant-Colonel Weir ; and by the Fire Brigade under Mr. Nichols, Chief ; and they desire to express their best thanks for the good work done by the Sisters, Nurses, and by all departments.

30th June 1897.

W. GATACRE, BRIGDR.-GENL.,

Chairman, Plague Committee.

P. C. H. SNOW.

H. P. DIMMOCK.

C. C. JAMES.

Examined by

W. F. CAHUSAC,

Secretary.

Appendix No. 1.

Whereas a dangerous disease, namely, Bubonic Fever, has broken out in certain parts of the City of Bombay and the Municipal Commissioner is of opinion that the ordinary provisions of the City of Bombay Municipal Act, 1888, or any other law in force in Bombay are insufficient for the purpose of effectually preventing the spread of such disease, public notice is hereby given that, with the sanction of Government, and pursuant to the provisions of Section 484 of the said Act, the Commissioner hereby prescribes the following temporary regulations to be observed by the public and all persons concerned, and further that the Commissioner will, if necessary, take such special measures as are hereby indicated for carrying into effect the objects of the said regulations :—

1. In extension of the provisions of Sections 422, 425 and 427 of the said Act, it is hereby prescribed that every person having the control or any charge of any building or part of a building shall, on demand of the Commissioner or any officer to whom the powers, duties, or functions of the Commissioner under those sections may have been or may be delegated, immediately cause such building or part of a building to be opened, and shall permit the Commissioner or any such officer as aforesaid to cleanse and disinfect the same, and to cause the removal or disinfection or destruction of any grain, bedding or clothing, or of any other goods or articles found therein.

For the purpose of carrying into effect the objects aforesaid, the Commissioner or any such officer as aforesaid will, whenever he shall deem it necessary so to do, break open and forcibly enter any such building or part of a building, and, without previous notice to the owner or occupier thereof, will cleanse and disinfect the same, and direct or cause the forcible removal and disinfection or destruction of any grain, bedding, clothing, goods, or articles as aforesaid.

2. In extension of the provisions of Section 424 of the said Act it is hereby prescribed that any person suffering from Bubonic Fever, wheresoever found and whether provided with proper lodging or accommodation or not, or whether lodged in a building occupied by more than one family or not, shall, on a certificate signed by the Executive Health Officer or by any duly qualified medical practitioner that such person is suffering from the said disease, be liable to be removed to any hospital or place at which patients suffering from the said disease are received for medical treatment.

For the purpose of carrying into effect the objects of this regulation the Commissioner or any officer to whom the powers, duties, or functions of the Commissioner under Section 424 have been or may be delegated, or any Police officer empowered by the Commissioner in this behalf will, whenever he shall deem it necessary so to do, cause any person in respect of whom such certificate as aforesaid has been made to be removed to any such hospital or place as aforesaid.

3. Every house in which any case of the aforesaid disease exists or has existed shall, for so long as the Commissioner shall deem necessary, be isolated in accordance with such orders as the Commissioner may in each case prescribe, and every

occupant of such house and other person who may be therein or who may resist or desire to obtain access thereto shall obey any order which he may receive from the Commissioner or any Municipal or Police officer empowered by the Commissioner in that behalf, prohibiting ingress to or egress from such house.

For the purpose of carrying into effect the objects of this regulation, the Commissioner or any such Municipal or Police officer as aforesaid will, if necessary, forcibly prevent persons from entering or leaving such house.

P. C. H. SNOW,
Municipal Commissioner.

BOMBAY, 6th October 1896.

On October 14th the Commissioner had to issue the following memorandum to the Health Officer :—" In reference to the recent Notification published by the Commissioner under Section 434 of the Municipal Act, as few cases of bubonic fever have occurred in the last day or two and influential petitions and representations have reached the Commissioner from the whole district of Mandvi and other parts of the town against the compulsory removal of patients to the Arthur Road Hospital, the Commissioner now directs the Health Officer as follows :—" Where cases of bubonic fever break out in the houses of persons who are able to properly tend and feed their sick, and isolate them in any reasonable degree, the Health Officer should, on all occasions, allow such persons to be tended in their own houses and not permit their removal to the Arthur Road Hospital. Every possible consideration should be shown to the caste and prejudices of persons whose houses the Health Department officials have to enter. The Health Officer is requested to instruct his officials accordingly without any delay, and to see that this order is carefully complied with.' "

On October 30th the following proclamation was issued :—" Whereas the Municipal Commissioner is informed that great alarm has been caused to the public by the Notification recently issued under Section 434 of the Municipal Act, and whereas the objects of that Notification have been misunderstood, inasmuch as the powers under it were obtained principally to meet the case of a large increase of bubonic plague, the public are now hereby informed that no cases, where proper segregation and treatment can be carried out on the premises, will be removed to the Arthur Road Hospital ; and, in such cases as require removal, no action will be taken except upon the certificate of a qualified medical practitioner employed by the Health Department. The Executive Health Officer has been instructed accordingly and the Commissioner of Police informed."

Another Notification, as follows, was issued to Mill Managers to be circulated amongst mill-hands :—" Whereas it has come to the notice of the Municipal Commissioner that false and unfounded reports, with the object of producing a general panic, have been recently spread among the mill-hands regarding the forcible removal to the Arthur Road Hospital ; and whereas, from information that has reached the Commissioner, it is desirable that such false impressions should be removed, you are hereby informed that, provided a competent medical officer is engaged to supervise the hands employed in your mill, the duty of attending thereto, and communicating with the Health Department in the event of any bubonic case occurring, will be left to such medical officer, and no person suffering from such disease will be removed to hospital except upon the certificate of the said medical officer. The Health Officer has been informed accordingly, and the name of any such medical officer appointed for your mill should be communicated to that department."

Appendix No. 2

The following tables give the total staff placed in each district who commenced operations as soon after the Plague Committee was constituted as possible. The strength of the various staffs shown was adhered to until the decline in plague at the latter end of May, when a reduction was effected.

DISTRICT NO. 1.

1 DISTRICT MEDICAL OFFICER OF HEALTH.

UPPER COLABA.		CENTRAL OFFICE.		LOWER COLABA.	
POPULATION	... 4,335	Central Office near Afghan Memorial Church.		POPULATION	... 13,622
HOUSES	... 164	3 Ambulances and Bullock Gharry. Stores.		HOUSES	... 1,194
Hospital.		Disinfecting Inspector.		Hospital.	
1/2 Section, 10 beds.		1 Non-Commissioned Officer.		1 Section, 20 beds.	
1 Ambulance.		1 Health Inspector.		2 Ambulances.	
Staff for House-to-House Visitation.		Telephone No. 223.		Sub-divisional Medical Officer.	
2 British Non-Commissioned Officers.		Office Staff.		Staff for House-to-House Visitation.	
10 British Soldiers.		1 Clerk.		3 Sub-Inspectors or Muccadums (Natives).	
Disinfecting Staff.		1 Do.		2 Police Sepoys.	
1 Sub-Inspector.		1 Timekeeper.		10 Military Sepoys.	
1 Muccadum (Overseer).		6 Military Sepoys.		Disinfecting Staff.	
25 Men.		TOTAL STAFF.		1 Sub-Inspector.	
Sub-divisional Medical Officer	... 1	Inspector	... 1	1 Muccadum.	
Non-Commissioned Officers	... 3	Sub-Inspectors	... 5	25 Men.	
British Soldiers	... 10	Clerks	... 2	Muccadums (Overseers)	... 2
Total...	... 14	Timekeeper	... 1	Military Sepoys	... 16
		Total...	... 9	Police Sepoys	... 2
				Coolies	... 50
				Total...	... 70
		Grand Total	... 93.		

DISTRICT NO. 2.

1 DISTRICT MEDICAL OFFICER OF HEALTH.

FORT, NORTH.		FORT, SOUTH.		ESPLANADE.	
POPULATION	...	POPULATION	...	POPULATION	...
HOUSES	...	HOUSES	...	HOUSES	...
...	3,951	...	32,847	...	10,064
...	469	...	1,195	...	458
Justices of the Peace.		1 Sub-Divisional Medical Officer.		Justices of the Peace.	
O. W. L. Jackson, Esq.		Central Office close to Queen's Statue.		W. Greaves, Esq.	
Dr. C. H. F. Underwood.		4 Ambulances.		E. B. Raikes, Esq.	
Bomanshaw Entee, Esq.		1 Bullock Cart.		W. B. Young, Esq.	
Rusomjee N. Jijibhoy, Esq.		Stores.		Sassoon J. David, Esq.	
Dr. Jahangir J. Kureetji.		Telephone No. 1048.		J. N. Tata, Esq.	
Hormasji C. Kolawalla, Esq.		Office Staff		Staff for House-to-House Visitation.	
Dr. Narabhoj N. Katruk.		1 Head Clerk.		2 Sub-Inspectors or Muccadums (Natives).	
N. J. Gamadia, Esq.		2 Clerks.		4 Police Sepoys.	
Edalji Nasarwanji, Esq.		1 Timekeeper.		16 Military Sepoys.	
Dr. Byramji Darabhet.		2 Ramosees (Watchmen).		Disinfecting Staff.	
Dr. Temulji B. Nariman.		4 Ambulance Sepoys.		1 Muccadum.	
Bomanji B. Patel, Esq.		1 Health Inspector.		25 Men.	
Dr. B. B. Shroff.		Justices of the Peace.		Total Staff	
F. Ramdas R. Joshi, Esq.		G. W. Roughton, Esq.		Head Clerk	
Staff for House-to-House Visitation.		W. Pearson, Esq.		Clerks	
4 Sub-Inspectors or Muccadums (Natives).		F. Hutchinson, Esq.		Timekeeper	
6 Police Sepoys.		District Hospital, Mody Khana.		Ramosees (Watchmen)	
24 Military Sepoys.		No. 1 Section, 20 beds.		Ambulance Sepoys	
Disinfecting Staff.		1 Lady Doctor.		Inspector	
2 Muccadums.		Staff for House-to-House Visitation.		Sub-Inspectors	
70 Men.		2 Sub-Inspectors or Muccadums.		Muccadums (Overseers)	
		4 Police Sepoys.		Men	
		16 Military Sepoys.		Police Sepoys	
		Disinfecting Staff.		Military Sepoys	
		1 Inspector.		Total	
		2 Muccadums.		...	
		50 Men.		...	

DISTRICT NO. 3.

1 DISTRICT MEDICAL OFFICER OF HEALTH.

VI.		CHAKLA.		CENTRAL OFFICE.		OOMARKHADI. DONGRI.	
POPULATION ...	87,295	POPULATION ...	82,197	Junction of Argyle Road and Musjid Bridge Road.		POPULATION. 52,468	POPULATION. 30,317
HOUSES ...	1,615	HOUSES ...	1,080	4 Ambulances		HOUSES ... 1,784	HOUSES ... 1,064
Sub-divisional Office at Central Office.		Sub-divisional Office at Chakla on Carnac Road.		1 Bullock Gharry. Stores.		Sub-divisional Office.	
1 Sub-divisional Medical Officer.		1 Sub-divisional Medical Officer.		1 Health Inspector.		South-West of Jail Road.	
4 Ambulances.		4 Ambulances.		1 Disinfecting Inspector.		1 Sub-divl. Medical Officer.	
1 Bullock Gharry. Stores.		1 Bullock Gharry. Stores.		Telephone No. 226.		6 Ambulances.	
Justices of the Peace.		Justices of the Peace.		Office Staff		1 Bullock Gharry. Stores.	
Hussanbhoy Vishram, Esq.		B. M. Moses, Esq.		1 Head Clerk.		Justices of the Peace.	
Budrodeen A. Kur, Esq.		Vithalrao C. Bhandikar, Esq.		3 Clerks.		Moulvi Hedayut Allah, Esq.	
Haji Yusuf Haji Ismail, Esq.		Haji Mahomed Ibrahim, Esq.		2 Ramosees.		Dr. Ismail Jan Mahomed.	
Dr. J. P. Nicholson.		Khan Sahab Fakirji Jivaji, Esq.		4 Ambulance Sepoys.		Dr. Dossabhai Patel.	
Rahimtulla Khairaz, Esq.		Ahmedbhai Hubbbhoy, Esq.		1 Timekeeper.		Mahomed Ali Adumji Peerbhai, Esq.	
Haji A. Sutar, Haji Yumb, Esq.		Basole B. Batale, Esq.		Total Staff.		Staff for House-to-House Visitation.	
Mahomed Nancy Khairaz, Esq.				Sub-divisional Medical Officers ...		8 Sub-Inspectors or Muccadums.	
M. M. Chino, Esq.				Justices of the Peace ...		12 Police Sepoys.	
Staff for House-to-House Visitation.		Staff for House-to-House Visitation.		Inspectors ...		48 Military Sepoys.	
4 Sub-Inspectors or Muccadums.		3 Sub-Inspectors.		Sub-Inspectors ...		Disinfecting Staff.	
4 Police Sepoys.		4 Police Sepoys.		Muccadums (Overseers) ...		1 Sub-Inspector.	
20 Military Sepoys.		20 Military Sepoys.		Men ...		6 Muccadums.	
Disinfecting Staff.		Disinfecting Staff.		Police Sepoys ...		200 Men.	
1 Sub-Inspector.		1 Sub-Inspector.		Military Sepoys ...		Office Staff.	
4 Muccadums.		5 Muccadums.		Ramosees (Watchmen) ...		2 Clerks.	
100 Men.		120 Men.		Head Clerk ...		1 Timekeeper.	
Note.—This District will work to Nos. 3 and 8 Hospitals.		Office Staff.		Clerks ...		2 Ramosees.	
		1 Clerk.		Timekeepers ...		6 Ambulance Sepoys.	
		1 Timekeeper.		Ambulance Sepoys ...		GRAND TOTAL	
		2 Ramosees.		GRAND TOTAL		... 615	
		4 Ambulance Sepoys.					

DISTRICT No. 4.

1 DISTRICT MEDICAL OFFICER OF HEALTH.

MARKET.		BHULESHWAR.		Central Office.		KHARATALAO.		KHUMBAWADA.	
POPULATION	... 44,751	POPULATION	... 38,363	Pydhonie (under advertisement for Singer's Machines).	...	POPULATION	... 27,035	POPULATION	... 32,209
HOUSES	... 1,724	HOUSES	... 1,331	6 Ambulances.	...	HOUSES	... 720	HOUSES	... 914
Sub-divisional Office.		Sub-divisional Office.		6 Ambulance Sepoys.	Stores.	Sub-divisional Office.		Sub-divisional Office	
On Footpath near Shoe Bazaar.		Attached to Central Office.		2 Bullock Gharries.		Attached to Central Office.		Attached to Central Office.	
Sub-divisional Medical Officer.		Sub-divisional Medical Officer.		1 Head Clerk.	Telephone No. 1044.	1 Sub-divisional Medical Officer.		1 Sub-divisional Medical Officer.	
Justices of the Peace.		Justices of the Peace.		3 Clerks.		Justices of the Peace.		Justice of the Peace.	
Jambhan N. Nadkarni, Esq.		J. Brito, Esq.		2 Timekeepers.		Nazir Mahomed Fattahalli, Esq.		Nil.	
Panilal J. Singani, Esq.		Shamrao Pandurang, Esq.		2 Ramosees.		Dinsha Bomanji P. Master, Esq.		Staff for House-to-House Visitation.	
Lakshmidas Bhimji, Esq.		Lakshmidas Khimji, Esq.		Total Staff.		Staff for House-to-House Visitation.		4 Sub-Inspectors.	
Staff for House-to-House Visitation.		Staff for House-to-House Visitation.		Sub-divisional Medical Officers.	4	4 Sub-Inspectors.		5 Police Sepoys.	
4 Sub-Inspectors.		4 Sub-Inspectors.		Justices of the Peace ...	16	5 Police Sepoys.		16 Military Sepoys.	
5 Police Sepoys.		5 Police Sepoys.		Sub-Inspectors ...	20	16 Military Sepoys.		Disinfecting Staff.	
16 Military Sepoys.		16 Military Sepoys.		Munroodums (Overseers) ...	16	1 Sub-Inspector.		4 Munroodums.	
Disinfecting Staff.		Disinfecting Staff.		Police Sepoys...	20	100 Men.			
1 Sub-Inspector.		1 Sub-Inspector.		Military Sepoys ...	64				
4 Munroodums.		4 Munroodums.		Ramosees (Watchmen) ...	2				
100 Men.		100 Men.		Ambulances Sepoys ...	6				
				Head Clerk ...	1				
				Chakras...	3				
				Timekeepers ...	2				
				Men ...	400				
				Total...	554				

N.B.—This district will work to Nos. 4 & 6 Hospitals.

DISTRICT No. 5.

1 DISTRICT MEDICAL OFFICER OF HEALTH.

Dhoke Talao.	Panaswadi.
POPULATION ... 39,945	24,669
HOUSES ... 1,620	1,116
Sub-divisional Office attached to Central Office.	
2 Sub-divisional Medical Officers.	
Justices of the Peace.	
Dr. Byramji Bismil. Rastanjee V. Spencer, Esq. Dr. Cowasjee Pestonjee. Keshabhoy B. Ranina, Esq. N. B. Santook, Esq. Madhraj Khatri, Esq. Dedabhoj T. Mentr, Esq. D. J. Ferreira, Esq. Shantaram V. Khanjali, Esq.	
House-to-House Visitation.	
5 Sub-Inspectors or Muccadums. 15 Police Sepoys. 40 Military Sepoys.	
Disinfecting Staff.	
4 Sub-Inspectors. 2 Muccadums. 150 Coolies. 1 Timekeeper.	
Sub-divisional Medical Officers	3
Justices of the Peace	18
Inspectors	2
Clerks	4
	<hr/> 27

Central Office.	
Close to Cowasjee Franjees Institute.	
Telephone No. 1049.	
4 Ambulances. 1 Bullock Gharry.	
Stores.	
1 Head Clerk and Accountant. 2 Clerks. 6 Ambulance Sepoys. 1 Police Sowar. 2 Ramosees (watchmen). 1 Health Inspector. 1 Disinfecting Inspector.	
District Hospital (2 Sections), Charni Road	
Gardens.	
1 Hospital Assistant in charge. 1 Lady Doctor (available).	
TOTAL STAFF.	
Sub-Inspectors...	...
Military Sepoys	...
Police Sepoys	...
Muccadums (Overseers)	...
	<hr/> 114

Grand Total ... 348

POPULATION ...	Girgaum.	Chauvati.
HOUSES ..	... 26,999	11,512.
	... 1,280	902
Sub-divisional Office close to the Fire Temple in Thackerwar Road.		
1 Sub-divisional Medical Officer.		
Justices of the Peace.		
Daji A. Khare, Esq. Dr. Atmaram Pandurang. Narain V. Bapat, Esq. Chabildass M. Nathubhoj, Esq. Rai Bahadur Lachman Singh. Dr. Bhachundra Bhatawadekar. Dinshaw M. Pantbhoy, Esq. Cowasjee D. Dulmash, Esq. M. T. Talyarkhan, Esq.		
House-to-House Visitation.		
4 Sub-Inspectors. 6 Police Sepoys. 25 Military Sepoys.		
Disinfecting Staff.		
2 Sub-Inspectors. 2 Muccadums. 50 Coolies.		
Office Staff.		
1 Clerk. 1 Timekeeper. 2 Ramosees. 3 Ambulance Sepoys.		
Timekeeper	...	2
Ramosees (Watchmen)	...	4
Police Sowar	...	1
Coolies	...	200
		<hr/> 207

DISTRICT No. 6.

1 DISTRICT MEDICAL OFFICER OF HEALTH.

KAMATIPURA.		1st NAGPADA		2nd NAGPADA.	
POPULATION ...	29,208	POPULATION ...	11,183	POPULATION ...	18,768
HOUSES ...	1,344	HOUSES ...	245	HOUSES ...	545
Justice of the Peace.		Staff for House-to-House Visitation.		Staff for House-to-House Visitation.	
Jewanji Dharamsi, Esq.		2 Sub-Inspectors. 4 Police Sepoys. 6 Military Sepoys.		2 Sub-Inspectors. 4 Police Sepoys. 6 Military Sepoys.	
Staff for House-to-House Visitation.		Justice of the Peace.		Disinfecting Staff.	
2 Sub-Inspectors. 1 Muccadam. 4 Police Sepoys. 16 Military Sepoys.		P. F. Bhandara, Esq.		1 Sub-Inspector. 1 Muccadam. 40 Men.	
Disinfecting Staff.		Disinfecting Staff.		Total Staff.	
1 Sub-Inspector. 2 Muccadams. 70 Men.		Medical Officers ... Justices ... Inspectors ... Sub-Inspectors ... Muccadams (Overseers) ... Men ...		Police Sepoys ... Military Sepoys ... Clerks ... Timekeeper ... Ramoses (Watchmen) ... Ambulance Sepoys ...	
		Total ... 160		Total ... 49	
		Grand Total ... 209.			

DISTRICT No. 7.

1 DISTRICT MEDICAL OFFICER OF HEALTH.

WALKESHWAR. POPULATION 12,990 HOUSES 1,865 2 Sub-divisional Medical Officers. OFFICE ATTACHED TO CENTRAL OFFICE. Justices of the Peace. C. W. Chitty, Esq. L. Penny, Esq. B. Goelling, Esq. S. E. Warden, Esq. S. M. Moses, Esq. S. H. Nathan, Esq. Mulji B. Barbhaya, Esq. Oureeji N. Banaji, Esq. Staff for House-to House Visitation. 4 Sub-Inspectors or Muccaduma. 6 Police Sepoys. 18 Military Sepoys. Disinfecting Staff. 2 Sub-Inspectors or Muccaduma. 70 Men.		Central Office. Near Post Office, Ridge, Malabar Hill. Stores. 4 Ambulances. 1 Bullock Chattry. Telephone-Plague Office. Office Staff. 1 Head Clerk. 2 Clerks. 4 Ambulance Sepoys. 2 Ramosees. 1 Timekeeper. 1 Health Inspector. 1 Disinfecting Inspector. District Hospital. 1 Section (20 beds), Forjett Road. 1 Hospital Assistant.		MAHALAKSHMI. POPULATION 17,014 HOUSES 1,279 1 Sub-divisional Medical Officer. Sub-divisional Office. Junction of Pedder and Warden Roads. Office Staff. 1 Clerk. 1 Timekeeper. 2 Ramosees. 3 Ambulance Sepoys. Justices of the Peace. H. Bicknell, Esq. A. Turner, Esq. P. R. Wilson, Esq. N. P. Wadia, Esq. H. Dadaboy, Esq. Hiribhoy Laji, Esq. K. R. Kama, Esq. Furdonji M. Banaji, Esq. *	
TOTAL STAFF. Sub-divisional Medical Officers ... 3 Justices of the Peace 16 Inspectors 2 Sub-Inspectors 12 Police Sepoys 12 Military Sepoys 36 Men 140 Total ... 221		Ramosees (Watchmen) 6 Head Clerk 1 Clerks 2 Timekeeper 1 Ambulance Sepoys 7 Total ... 17		Staff for House-to-House Visitation. 4 Sub-Inspectors or Muccaduma. 6 Police Sepoys. 18 Military Sepoys. Disinfecting Staff. 2 Sub-Inspectors or Muccaduma. 70 Men.	

Grand Total ... 238

DISTRICT No. 8.

DISTRICT MEDICAL OFFICER OF HEALTH.

[illegible]

DISTRICT No. 9.

1 DISTRICT MEDICAL OFFICER OF HEALTH.

TARWADI.		CENTRAL OFFICE.		MAZAGON.	
POPULATION	... 21,298	North-East end of Connaught Road.		POPULATION	... 58,640
HOUSES	... 1,159	Telephone No. 941.		HOUSES	... 1,946
1 Sub-divisional Medical Officer.		Office.		1 Sub-divisional Medical Officer.	
Attached to Central Office.		Port Trust Ground at Wari Bunder.			
Justice of the Peace.		Justices of the Peace.			
Aga Abdul Humain.		S. J. DeSouza, Esq.			
		Furdoonji Parekh, Esq.			
Staff for House-to-House Visitation.		Staff for House-to-House Visitation.			
4 Sub-Inspectors.		4 Sub-Inspectors.			
3 Police Sepoys.		3 Police Sepoys.			
10 Military Sepoys.		10 Military Sepoys.			
Disinfecting Staff.		Disinfecting Staff.			
2 Sub-Inspectors.		2 Sub-Inspectors.			
2 Muccadums.		2 Muccadums.			
100 Coolies.		100 Coolies.			
		Office Staff.			
		1 Clerk.			
		1 Timekeeper.			
		2 Ramosees.			
		4 Ambulance Sepoys.			
		District Hospital, Wari Bunder.			
		No. 1 Section, 20 Beds.			
Sub-Divisional Medical Officers	... 2	Military Sepoys	...	Military Sepoys	... 28
Justices of the Peace	... 3	Ramosees (Watchmen)	...	Ramosees (Watchmen)	... 4
Health Inspector	... 1	Muccadums (Overseers)	...	Muccadums (Overseers)	... 4
Total	... 6	Coolies	... 200	Coolies	... 200
		Total	... 236	Total	... 236

DISTRICT No. 10.

1 DISTRICT MEDICAL OFFICER OF HEALTH.

SION.		MAHIM.		PAREL GOVERNMENT HOUSE.		WORLI.		* PAREL	
POPULATION ...	19,601	POPULATION ...	18,565	POPULATION ...	35,493	POPULATION ...	...	POPULATION ...	28,740
HOUSES ...	2,318	HOUSES ...	2,912	HOUSES ...	2,912	HOUSES ...	2,286	HOUSES ...	1,229
Sub-divisional Office and Store. KURLA CAUSEWAY.		Sub-divisional Office and Store. BANDRA CAUSEWAY.		Central Office and Store. Telephone No. 1047 Spare Ambulances. Stores. 1 Bullock Charry. 1 Head Clerk and Accountant. 2 Clerks. 4 Ramosees. 1 Police Sowar.		Sub-divisional Office and Store. 1 Sub-divisional Medical Officer. District Hospital. No. 1 Section ... 20 beds.		Sub-divisional Office at * Central Office. Parel District Hospital, Government House, In Independent Charge.	
STAFF FOR INFLEX OF POPULATION. Military Guard of 10 Sepoys.		STAFF FOR INFLEX OF POPULATION. Military Guard of 10 Sepoys. MAHIM LEVEL CROSSING. 6 Railway Police Sepoys.		Justice of the Peace. Dr. Deane. G. Cotton, Esq. Vet.-Major Mills. K. M. Shroff, Esq. Dr. Dhanjisha Tata. Vasuji Khimjee, Esq.		Justice of the Peace. Dr. Deane. G. Cotton, Esq. Vet.-Major Mills. K. M. Shroff, Esq. Dr. Dhanjisha Tata. Vasuji Khimjee, Esq.		Justice of the Peace. Dr. Deane. G. Cotton, Esq. Vet.-Major Mills. K. M. Shroff, Esq. Dr. Dhanjisha Tata. Vasuji Khimjee, Esq.	
District Hospital. No. 2 Section ... 40 beds. Ambulances. Bullock Charry. 1 Sub-divisional Medical Officer.		District Hospital. No. 2 Section ... 40 beds. Ambulances. Bullock Charry. 1 Sub-divisional Medical Officer.		1 Health Inspector.		Justice of the Peace. Dadabhai Jijibhai, Esq.		Staff for House-to-House Visitation. 4 Sub-Inspectors. 3 Police Sepoys. 10 Military Sepoys.	
Justice of the Peace. Adamjee Peerbhoy, Esq. Mahomed Ali Adamjee Peerbhoy, Esq. Abdul Hussain Adamjee Peerbhoy, Esq.		Justice of the Peace. J. C. Cama, Esq. Dr. DeMonte. Dr. B. A. Oliveira. Jahangir Hormasji Mody, Esq.		1 Disinfecting Inspector.		Disinfecting Staff. 1 Sub-Inspector. 1 Mucadum. 25 Men.		Staff for House-to-House Visitation. 4 Sub-Inspectors. 6 Police Sepoys. 24 Military Sepoys.	
Staff for House-to-House Visitation. 4 Sub-Inspectors. 3 Mucadum. 3 Police Sepoys. 10 Military Sepoys.		Staff for House-to-House Visitation. 4 Sub-Inspectors. 4 Police Sepoys. 16 Military Sepoys.		1 Lady Doctor.		Office. 1 Clerk. 1 Timekeeper. 1 Sepoy. 2 Ramosees.		Disinfecting Staff. 1 Sub-Inspector. 1 Mucadum. 25 Men.	
Disinfecting Staff. 1 Sub-Inspector. 1 Mucadum. 25 Men.		Disinfecting Staff. 1 Sub-Inspector. 1 Mucadum. 25 Men.		Medical Officers ... Inspectors ... Clerks ...		Total Staff. Sub-Inspectors ... Timekeepers ... Mucadums (Overseers) ... Police Sepoys ... Military Sepoys ... Police Sowar (Mounted Police) ...		Coolies ... Ramosees (Watchmen) ...	
Office. 1 Clerk. 1 Timekeeper. 1 Sepoy. 2 Ramosees.		Office. 1 Clerk. 1 Timekeeper. 3 Sepoys. 2 Ramosees.		Total... 23		Total... 135		Total... 110	
				Grand Total... 268					

Appendix No. 3.

PLAN No. 2.

(Compiled by C. C. James, Esq., A.M.I.C.E., Municipal Engineer, from the commencement of the Epidemic.)

Explanation of Plan.	Plan No. 2 is the Progress Map of the City, shewing the course of the disease from September 1896, in which month it was first officially recognised, to the end of June 1897.
Primary colours.	The primary colours have been made use of in this plan in their regular order, as shewn by the large coloured circles in the margin, month by month, and this has been continued after the 7th month by using the colours again and hachuring the circles.
Census Districts.	In the margin are also shewn all the Census Districts of the City.
Districts.	Each District, as it became epidemic, was coloured with the colour distinguishing the month in which the disease arrived at the epidemic stage, and under each marginal District heading is shewn the number of cases taking place monthly in that District after the disease had become epidemic.
Epidemic.	<p>In deciding on the epidemic state of a District, great care was taken to carefully watch the distribution of the cases throughout the District, and this was done in many instances by plotting on a plan the actual cases house by house. It has often occurred in this City that plague has raged in an epidemic form in small and confined areas, especially those inhabited by Kolis (fishermen), while beyond such areas it has only been in a sporadic form. In such cases the whole District was not considered epidemic.</p> <p>Previous to and after the epidemic period, cases appertaining to the month in which they occurred are shewn by coloured circles placed in the District, according to the monthly colour; the number of cases shewn in the circle indicates the number occurring in that month.</p>
Re-infection.	On the re-infection of a District, a square is substituted for a circle; thus it will be seen that the District of Mandvi, one of the first infected, had 31 cases, as shewn by the red coloured circle in September. In October it became, similarly with Dongri, Omerkhadi and Chakla, epidemic, and the whole District has been coloured orange. A reference to the margin will shew that 199 cases occurred in that month; in November it was not epidemic, and the number of cases (52) are shewn by a yellow circle. Mandvi never became epidemic again, and a reference to the circles will shew that December gave 55 cases, January 23, February 10. In March there was a very distinct recrudescence equally divided all over the District (but not amounting to a fresh epidemic)—this is shewn by a coloured square; April shows a still more pronounced recrudescence but in a limited area, and 70 cases are shewn in the coloured and hachured square representing this month. May shews a great decline, having only 12 cases against it, and June, 3 cases.
Recrudescence in Mandvi.	The reason of this recrudescence is probably to be found in the fact that in the month of February the plague had so declined in Mandvi, that the inhabitants who fled from it in October and November came back in large numbers from the mofussil, many of them bringing plague with them; and people living in other parts of the city more affected showed a strong inclination to go to Mandvi in the belief that there would be no further plague in that District.
Second Epidemic in Dongri.	For a second epidemic the number of cases for the month is shewn in red in the margin under the District heading. (<i>Vide</i> the District of Dongri.) In September there were 20 cases in this District, as evidenced by the red circle. In October it became epidemic, as before stated, and continued during November and December as shewn in the margin; but in January, as seen by the circle coloured blue, only 13 cases are reported. In February a well-defined recrudescence occurred all over the District, amounting to an epidemic, and the cases (65) are shewn under the marginal District heading in red figures; this recrudescence continued during March and April, and is recorded in the same way; but in May the cases dropped down to 10, and they are expressed by a coloured hachured circle in the District; in June the number was 11.

In taking a general view of this plan, it will be noticed that in October the plague was General view of Plan. epidemic in the following places :—

<i>Mandvi.</i>	<i>Pongri</i>
<i>Umarkhadi.</i>	<i>Chakla.</i>
<i>Lower Colaba.</i>	

These Districts represent a normal population of 165,899.

In November there was a marked subsidence of plague and no fresh District is registered as being epidemic. This represents a curious feature noticeable in the course of plague in this City and which will be further referred to hereafter, namely, that lulls which give false security occur in the disease, which again breaks out with increased virulence.

In December the disease broke out suddenly over a large area, and the mortality chart (Plan No. 3) shews a sudden and continued rise from the 30th of November onwards. The Districts in which the disease became epidemic in December are :—

Fort, North,	Fanaswadi,
Market,	Girgaum,
Bhuleshwar,	Chauapati,
Kharatalao,	Kamatipura,
Kumbarwada,	1st Nagpada,
Dhobitalao,	2nd „
Byculla,	Tarwadi,
Tardeo,	Mazagon,
Khetwadi,	Mahalakshmi,

representing a normal population of 408,786 souls.

Up to the end of January the whole of the North of the Island, represented by North of the Island. Worli, Parol, Sewree, Mahim and Sion had been practically free from disease, owing probably to the fact that its population, according to its area, compared with the rest of the City, was small and less overcrowded. But at the end of February and the beginning of January a large influx of people from the rest of the City occurred, bringing with them, without doubt, the disease, and in a short time the whole of the above-mentioned Districts became affected. With them also Walkeshwar and Fort South, representing a normal population of 140,239.

In February, Upper Colaba, containing 4,338 souls, the District occupied by the Upper Colaba. Royal Artillery and British Infantry Regiments, became badly affected and epidemic, in spite of its practically isolated position and the strict sanitary supervision maintained there.

The District of the Esplanade with its 10,064 inhabitants is the only one in the whole City that can boast of having but little plague in it during the whole nine months, and that it never became epidemic.

The whole of the above figures in reference to plague cases have been compiled from the Municipal Health Department returns.

Appendix No. 4.

PLAN No. 3.

(Compiled by C. C. James, Esq., A.M.I.C.E., Municipal Engineer, from the commencement of the Epidemic.)

Plan No. 3.

Plan No. 3 shows the mortality from all causes which occurred in the City of Bombay from August 1st, 1896, to June 30th, 1897, registered concurrently with the following data:—

Maximum temperature	...	...	...	} Indicated on the plan by thick black lines.
Minimum do.	...	...	...
Population	...	...	...	Do. do. thin blue line.
Humidity	...	...	...	Do. do. green line.
Daily mortality	...	...	...	Do. do. thick red line.
Normal mortality, previous five years' averages	...	...	...	Do. do. thin red line.
Velocity of wind	...	...	...	Do. do. purple line.
Clouds	...	...	...	Do. do. brown line.

Scale.

The horizontal scale is six days to one inch ; the vertical scale varies as shown in the left hand margin.

Information obtained.

The information compiled in this chart has been obtained as follows:—

The maximum and minimum temperatures, humidity, velocity of wind, and amount of clouds, have been obtained from the published records of the Colaba Observatory.

The population, from Mr. F. C. Rimington, Managing Director of the Tramway Company, who has based his returns on the averages of tramway receipts extending over several years ; these returns have been checked with the information published by the Chamber of Commerce and may therefore be taken as substantially correct.

The daily mortality, from the cemetery returns of the Municipal Health Department.

The normal mortality, the average of five previous years from the returns published in the Government Gazette.

The red figures at the top of the chart are the total deaths from all causes for the month, and the red figures at the bottom of the chart are the total deaths from plague.

Plague deaths.

The total number of deaths from plague has been arrived at in the following manner:—

The total deaths from all causes for the week has been taken from the published returns in the *Government Gazette*, and also the total deaths for the week, average of five years previously. The latter has been deducted from the former, the result has been taken as plague, and as there was no other known disturbing cause to which deaths could be attributed, this result may be assumed to be substantially correct. To the above figures has been added the amount shown in red above the plague returns for the month. That figure has been obtained as follows:—Take, for example, the last three days in December and the first four days in January, during which time 1,711 deaths were reported. The average for that week, based on five previous years, is 494 with a population of 850,000, but the population in January 1897 was a figure (*vide Chart*) between 680,000 and 562,000 ; therefore a proportionate number less than 494 must be taken, *viz.*, 361, and this gives an amount of 133 over the 1,217 recorded for plague.

The above calculation has been made all through the months in which the population has been below 850,000.

One of the ideas in compiling this chart was to check some of the theories advanced that temperature, humidity, wind, and clouds had a definite bearing on the daily mortality of the city. Object of compilation of Chart.

In reading the chart with a view to obtain a deduction of this kind from excessive range of temperature, surplus clouds or other disturbing elements, a period of five days must be taken as being the average number of days for the incubation of plague.

For example, on the 21st of November a cyclone occurred which gave a velocity of wind of 27·23 miles per hour ; taking five days as the average length of incubation, a high rate of mortality might have been expected on the 26th November, but this was not the case.

Again, in studying the chart, it may be said that the line of humidity closely follows the line of mortality, but this is merely a coincidence of plotting, as a glance at the humidity and mortality lines previous to the first of November will show, and the scales are entirely different. Humidity.

Clouds, too, have been said to have a bearing on the death-rate ; the period extending from the 15th to the 30th of December gives on some days a unit of eight of clouds (ten being the maximum), which means nearly a wholly cloudy day, while the other days average five ; taking the average incubation period, it cannot be argued that clouds then had an adverse bearing on the death-rate, as the deaths for the next week are less than the previous, and further examples of the same kind appear on looking more closely into the chart. Clouds.

It would appear that a low temperature may have had an adverse bearing on the disease, as through the months of December, January, and February, when the minimum temperature was the lowest for the year, the mortality was greatest ; but on the other hand it must be remembered that at this time few people slept in the open air as is their habit in warm weather ; the overcrowding in chawls and houses was therefore greater and the disease consequently accentuated.

It is probable, however, that we must look even farther than the range of this chart for the meteorological conditions having a possible bearing on the disease.

The mean annual temperature of last year was 80·07°, being the highest but one on record for the last fifty years.

The total fall of rain for the year was 87·65" ; this again is abnormal, being nearly 15" above the average of the past fifty years.

These facts in themselves would, without further explanation, mean little, but it is necessary to consider the details of this fall of rain.

June gave 28·02", being 8" above the average. July 36·44", being 11·7" above the average, August 20·8", being 7·5" above the average ; after the end of August only 1·61" of rain was registered, 10" less than the average.

The above shows the serious and abnormal conditions of the period immediately preceding the advent of plague in the city and means that, with the moist and heated atmosphere of August, an unusual amount of evaporation was going on, drawing from a soil, *water and sewage-logged*, exhalations which must, of necessity, have had a distinctly adverse bearing on the health of the town.

Features of Chart.

One of the most interesting features in the chart is the steady fall of population from the 8th of December to the middle of February and the rise in the daily mortality against it for the same period. A decrease in population from 850,000 to 487,000, flying from a pestilence, in a little over two months, is probably unique in the history of the world.

But there is still another point which may be noticed, *i.e.*, the extraordinary daily fluctuations of the death-rate, in December, January and February, which point very distinctly to the good resulting from the sanitary measures undertaken—a fact borne out by charts of other Plague epidemics, in which, either from total absence of sanitary conditions or lack of rigid measures, the number of deaths per day ran into thousands; in Bombay during the whole time of the epidemic the number only twice exceeded 300, and the total number who died from plague from the beginning of August to the 30th of June was 26,569.

On the 2nd of March 1897, as shown on the chart, the Plague Committee was appointed under Government Resolution No. ¹²⁰⁴ 702-F; from that date an improvement took place in the conditions of things. This is more marked after the 15th of the month, when it will be seen that the mortality line took regular steps on the downward grade, *viz.*, from the 16th to the 30th, from the 2nd of April to the 10th, from the 12th to the 17th, from the 20th to the 30th, and from that date an almost steady declining line, with no recrudescence, in many instances below the normal mortality and against a rapidly rising population line, all emphasising the advantage of systematic sanitation.

Advent of Rains.

It was foretold by many that the advent of the rains would raise the mortality and bring a recrudescence; this has not been borne out by facts, at any rate so far as the period to the end of June, with which the chart deals.

It will be noticed that during the whole of May 1897 the daily mortality was below the average mortality of the five previous years, which has made it difficult to calculate the number of plague deaths correctly, but the figures shewn have been obtained by calculating the difference in population and deducting the result from the weekly mortality; this gives the nearest approach to actuals obtainable.

Appendix No. 5.**PLAN No. 5.**

Plan No. 5 is a drawing of ambulance No. 1. This ambulance was constructed by Messrs. Richardson and Cruddas, from whom the Committee purchased 50 of these vehicles.

The body is constructed of a light angle-iron framing, 6'-6" long and 2'-7" wide, connected by a central angle-iron between the longitudinals, and hoop-iron latticing on each side of it.

The longitudinal angles are carried out at each end for a length of about 15 inches, and bent downwards, the edges of the angles being bent, to form a tube, and pieces of wood inserted for handles.

The body rests on two light, well-tempered, carriage springs, which give a play of about 1½ inches. The springs are fixed on two bicycle wheels, 30 inches in diameter, with 1½ inch cushion tyres, which revolve on spindles tightly fixed into brass blocks, on which the springs rest, these blocks being connected with each other by one inch diameter gas piping.

A movable stretcher of teak rests on the inside of the framing on four short feet. A mattress, covered with oil-cloth, is placed inside the stretcher, and has one end raised, forming a pillow.

A waterproof covering of "Millerraine" Khaki is supported on a light frame, the feet of which fit into sockets fixed on the stretcher.

The cart is provided with four angle-iron legs, having cast-iron balls at their ends which support it when it is at rest.

This ambulance was found to be somewhat more convenient than No. 2, as the stretcher is removable from the sides instead of the end.

Appendix No. 6.

PLAN No. 6.

Plan No. 6 is a drawing of Ambulance No. 2 as constructed by Mr. B. H. Hewett, Assistant Engineer, Mechanical Branch, Bombay Municipality.

This Ambulance, of which 13 were made, was used with very great success; it gave considerable satisfaction to natives who were unfortunate enough to have to use it, and the dread of removal, so noticeable with the Municipal yellow van practically disappeared.

It was constructed principally of ordinary gas-piping jointed together with couplings, elbows, &c., the whole strung together with a steel wire, thus securing a very strong and at the same time a light frame.

The stretcher was constructed of the same material, with hoop iron lattice, upon which was placed an ordinary mattress and pillow, waterproofed.

It was suspended by means of four spiral springs and could be detached and drawn out at either end; to facilitate this operation, three sets of brass rollers were fixed to the carriage framing.

As the work was very urgent and a light type of wheel was required, bicycle and tricycle wheels complete with ball-bearings were purchased and fitted to the carriages.

It was found however in practice that such wheels were of too light construction to withstand rough work; some of the stronger pairs obtained from tricycles answered very well, but afterwards more substantial iron and rubber-tyred wheels were fitted, which made the ambulance perfectly reliable.

A white drill covering was suspended by six uprights and buttoned down at the lower extremities; to meet the exigencies of the monsoon, a cover, made of Duxbury's patent Millersained Khaki Drill, was made and was found to answer perfectly well.

No wood was used in the construction of this ambulance.

Appendix No. 7.

No. 1 DISTRICT.

Pilot Bunder, Government Hospital No. 1.

[illegible]

On 31st March, 1897, the hospital was closed and amalgamated with Government Hospital No. 2, Jamsctji Bunder.

Jamsetji Bunder, Government Hospital No. 2.

1 SECTION—20 BEDS.

[illegible]

No. 2 DISTRICT.

Modi Khana, Government Hospital No. 3.

1 SECTION—20 BEDS.

[illegible]

No. 3 DISTRICT.

Wari Bundler, Government Hospital No. 8.

2 SECTIONS—40 BEDS.

[illegible]

Nos. 4 & 5 DISTRICTS.

Charni Road, Government Hospital No. 4

2 SECTIONS—40 Beds.

Nurses	...	...	...	...	...	...	...	...	...	3
Ayals	...	...	...	...	...	...	...	...	...	3
Hospital Assistants...	...	...	...	...	...	...	...	...	...	2
Ward Orderlies	...	...	...	...	...	...	...	...	...	8
Bhoesties	...	...	...	...	...	...	...	...	...	2
Sweepers	...	...	...	...	...	...	...	...	...	3
Nurses' Servants	...	...	...	...	...	...	...	...	...	3
Cooks	...	...	...	...	...	...	...	...	...	2

No. 6 DISTRICT.

Grant Road, Government Hospital No. 6.

3 SECTIONS—60 Beds.

Nurses	...	...	...	...	...	...	...	...	...	6
Ayals	...	...	...	...	...	...	...	...	...	6
Hospital Assistants	...	...	...	...	...	...	...	...	...	3
Ward Orderlies	...	...	...	...	...	...	...	...	...	12
Bhoesties	...	...	...	...	...	...	...	...	...	3
Sweepers	...	...	...	...	...	...	...	...	...	4
Nurses' Servants	...	...	...	...	...	...	...	...	...	6
Cooks	...	...	...	...	...	...	...	...	...	3

No. 9 DISTRICT.

Narsikadi, Government Hospital No. 9.

1 SECTION—20 Beds.

Nurses	...	...	...	...	...	...	...	...	...	2
Ayah	...	...	...	...	...	...	...	...	...	1
Hospital Assistant	...	...	...	...	...	...	...	...	...	1
Ward Orderlies	...	...	...	...	...	...	...	...	...	4
Bhoesti	...	...	...	...	...	...	...	...	...	1
Sweepers	...	...	...	...	...	...	...	...	...	2
Nurses' Servants	...	...	...	...	...	...	...	...	...	2
Cook	...	...	...	...	...	...	...	...	...	1

No. 9 DISTRICT.

Reay Road, Government Hospital No. 10.

1 SECTION—20 Beds.

Nurses	...	...	...	...	...	...	...	...	...	2
Ayah	...	...	...	...	...	...	...	...	...	1
Hospital Assistant	...	...	...	...	...	...	...	...	...	1
Ward Orderlies	...	...	...	...	...	...	...	...	...	4
Bhoesti	...	...	...	...	...	...	...	...	...	1
Sweepers	...	...	...	...	...	...	...	...	...	2
Nurses' Servants	...	...	...	...	...	...	...	...	...	2
Cook	...	...	...	...	...	...	...	...	...	1

No. 10 DISTRICT.

Sion, Government Hospital No. 16.

2 SECTIONS—40 BEDS.

Nurses	...	...	...	...	...	...	...	...	...	...	3
Ayals	...	...	...	...	...	...	...	...	...	...	3
Hospital Assistants...	...	...	...	...	...	...	...	...	...	...	2
Ward Orderlies	...	...	...	...	...	...	...	...	...	...	8
Bheesties	...	...	...	...	...	...	...	...	...	...	2
Sweepers	...	...	...	...	...	...	...	...	...	...	3
Nurses' Servants	...	...	...	...	...	...	...	...	...	...	3
Cooks	...	...	...	...	...	...	...	...	...	...	2

No. 10 DISTRICT.

Mahim Causeway, Government Hospital No. 17.

2 SECTIONS—40 BEDS.

Nurses	...	...	...	...	...	...	...	...	...	...	3
Ayals	...	...	...	...	...	...	...	...	...	...	3
Hospital Assistants	...	...	...	...	...	...	...	...	...	...	2
Ward Orderlies	...	...	...	...	...	...	...	...	...	...	8
Bheesties	...	...	...	...	...	...	...	...	...	...	2
Sweepers	...	...	...	...	...	...	...	...	...	...	3
Nurses' Servants	...	...	...	...	...	...	...	...	...	...	3
Cooks	...	...	...	...	...	...	...	...	...	...	2

No. 10 DISTRICT.

Worli, Government Hospital No. 18.

1 SECTION—20 BEDS.

Nurses	...	...	...	...	...	...	...	...	...	...	2
Ayah	...	...	...	...	...	...	...	...	...	...	1
Hospital Assistant...	...	...	...	...	...	...	...	...	...	...	1
Ward Orderlies	...	...	...	...	...	...	...	...	...	...	4
Bheesties	...	...	...	...	...	...	...	...	...	...	1
Sweepers	...	...	...	...	...	...	...	...	...	...	2
Nurses' Servants	...	...	...	...	...	...	...	...	...	...	2
Cook	...	...	...	...	...	...	...	...	...	...	1

ESTABLISHMENT REQUIREMENTS.

TOTAL.

Nurses	...	...	...	...	...	...	...	...	...	...	31
Ayals	...	...	...	...	...	...	...	...	...	...	26
Hospital Assistants	...	...	...	...	...	...	...	...	...	...	16
Wards Orderlies	...	...	...	...	...	...	...	...	...	...	64
Bheesties	...	...	...	...	...	...	...	...	...	...	16
Sweepers	...	...	...	...	...	...	...	...	...	...	26
Nurses' Servants	...	...	...	...	...	...	...	...	...	...	28
Cooks	...	...	...	...	...	...	...	...	...	...	16

60 × 24 size of $\frac{1}{2}$ Section

120 × 24 „ 1 „

EQUIPMENT.

1-SECTION HOSPITAL.

FURNITURE.

Wards.

Tables ...	...	...	...	2	Towels ...	...	...	...	20
Screens ...	...	...	...	4	Plates ...	...	...	...	20
Chairs ...	...	...	...	2	Spoons ...	...	...	...	6
Washstand table	...	...	...	1	Pails ...	...	...	...	2
Cupboard ...	...	...	...	1	Spittoons, earthenware ...	...	...	...	20
Almirah ...	...	...	...	1	Iron can for poultices ...	...	...	...	1
Cots	20	Bowls, common	20
lanterns	6	Mats for cots	20

Office.

Table	1	Chairs	2
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Cook-room.

Table, common	1	Spoon, large	1
Kettle	1	Knife	1
Cooking utensils	6	Plates, iron	3
Cans for hot water, &c.	4	Pail	1

Dispensary.

Table	1	Shelf	1
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Hospital Assistant's Quarters.

Table	1	Bedstead, cheap, cane	1
Chair	1					

Nurses' Quarters.

2 Nurses—					Bedsteads, complete ...	...	...	...	2
Table ...	...	...	...	2	Commodore ...	...	...	...	2
Chairs ...	...	...	...	2	Chambers ...	...	...	...	2
Arm chair ...	...	...	...	1	Washstand and crockery ...	...	...	...	2 sets.
Shelf ...	...	...	...	1	Towel horse ...	...	...	...	2

Crockery, &c., for nurses.

Knives ...	...	...	...	4	Plates, large ...	...	...	...	2
Forks ...	...	...	...	4	Plates, small ...	...	...	...	2
Spoons ...	...	...	...	2	Tumblers ...	...	...	...	2
Tea-spoons ...	...	...	...	2	Tea-pot ...	...	...	...	1
Cups and saucers ...	...	...	...	2					

Food.

Medical Officers to arrange with contractor, 20th March 1897.

Clothing.

Pillow-cases ...	...	...	...	20	Sarces ...	...	...	...	20
Towels ...	...	...	...	2 doz.	Slippers (for ward-boys) ...	...	...	...	20 pairs.
Dusters (dunghree) ...	...	...	...	2 "	Socks ...	...	...	...	40 "
Blankets ...	...	...	...	40	Linen caps ...	...	...	...	8 doz.
Coats ...	...	...	...	30	Table cloths for Nurses ...	...	...	...	3
Trowsers ...	...	...	...	30	Women's night dresses ...	...	...	...	1 doz.
Dhoties ...	...	...	...	50	Children's ...	...	...	...	1
Sheets ...	...	...	...	30					

EQUIPMENT OF 1-SECTION HOSPITAL.

Instruments.

Enema tubes	2	No.	Measure glasses (2 oz.)	1	No.
Bottles, empty (6 oz.)	3	doz.	" " minim	1	"
Corks of sizes	$\frac{1}{2}$	gross	Scissors	1	pair.
Glasses for serving medicines	10	No.	Pill boxes of sizes	2	packets
Feeding cups	10	"	Pots, decoction, tin	2	No.
Clinical thermometers	4	"	" infusion	1	"
Bandages	1	doz.	Penal's camel hair	3	"
Cotton wool	$\frac{1}{2}$	lb.	Syringes, hypodermic	1	"
Syringe, large	1	No.	" onema	2	"
" small	1	"	" glass	2	"
Spatulas of sizes	2	"	Catheters, No. 6, 7, 8	3	"
Pestle and mortar	1	"	Corkscrew	1	"
Slab, small	1	"	Ice bags	3	"
Spirit lamp	1	"	Lint	$\frac{1}{2}$	lb.
Scales with weight and measures, grains, drums	1	set.	Cloth sheeting	12	yds.
Measure glasses (4 oz.)	1	No.	Bed-pans	3	No.
			Pocket-case	1	"

Medicines.

Acid Boric	1	lb.	Oleum Terebinthinæ	1	lbs.
" Carbolic	3	lbs.	" Arachis	6	"
" Gallic	2	oz.	Opium	4	drs.
" Hydrocyanicum Dil... ..	1	"	Potass Citratis	2	oz.
" Sulphuric	6	"	" Iodidum	2	"
Amonii Bromid	6	"	Pulvis Ipecacuanhæ co	1	"
Ammonii Carbonas	2	"	" Jalapæ Compositus	2	"
Aqua distillata	2	lbs.	Phenacetin	4	"
Argenti Nitræs	1	dr.	Pil. Hydrargyri	1	"
Acid Tartaric	8	oz.	Potass Bicarbonas	2	"
Alumen	8	"	" Chloras	8	"
Ammonii Chloride	1	lb.	" Nitræs	8	"
Atropin Sulph.	1	dr.	" Permanganatis	4	"
Bismuthi Subnitræs	4	oz.	Pal. Cretæ Aromatic O. Opio	8	"
Borax	4	"	Quinii Sulph.	8	"
Caffein Citratis	$\frac{1}{2}$	"	Potass Bromidum	6	"
Camphora	2	"	Saccharum alb.	$\frac{1}{2}$	lb.
Cocainæ Hydrochloras	1	dr.	Santoninum	$\frac{1}{2}$	oz.
Chiretta	2	lbs.	Sodii Bicarbonas	1	"
Chloroform	4	oz.	" Salicylas	3	(4 oz.)
Collodion A.	2	"	Spiritus Methylæ	4	oz.
Creasotum	1	"	" Etheris Nitrosi	1	lb.
Cupri Sulph.	4	drs.	" Amon. Aromat.	1	"
Diachylon Plaster	$\frac{1}{2}$	yd.	" Rectificatus	2	"
Extractum Belladonnæ	$\frac{1}{2}$	oz.	Sulphur Sublimati	1	lb.
" Ergotæ Liqui	2	"	Syrup Chloral Hydrate	8	oz.
" Gentian	1	"	Syrup Tola	8	"
Guaiacol	$\frac{1}{2}$	"	Tinctura Aconiti	$\frac{1}{2}$	"
Glycerine	$\frac{1}{2}$	lb.	" Aurantii	2	drs.
Gum Acacia Pulv. Opt.	$\frac{1}{2}$	"	" Cardomoni Co.	2	oz.
Hydrargyri Perchloridum	4	oz.	" Cinchonæ	2	"
" Subchloridum	$\frac{1}{2}$	"	" Digitalis	2	"
Iodoform	2	"	" Hamamelidis	2	"
Lint Camph. co.	$\frac{1}{2}$	lb.	" Hyoscyami	2	"
Lint. Iodi	4	oz.	" Iodi	4	"
Lint. Saponis	1	lb.	" Opii	4	"
Liq. Ammon. Acetatis	4	oz.	" Scillæ	2	"
Liq. Arsenicatis	4	"	" Asafoetid	2	"
Liq. Epispastics	$\frac{1}{2}$	"	" Belladonnæ	2	"
Liq. Morph Hydrochloris	1	"	" Catechu	4	"
Liq. Plumbi Subacetuti	1	lb.	Unguentum Hydrargyri	$\frac{1}{2}$	lb.
Liq. Strychninæ	2	oz.	" Simplex	1	"
Magnes Sulph.	4	lbs.	Vaselina	$\frac{1}{2}$	"
Oleum Anethi	$\frac{1}{2}$	oz.	Vin. Ipecac	$\frac{1}{2}$	"
" Mentha Piperitæ	1	"	Zinci Oxidum	$\frac{1}{2}$	oz.
" Cinamoni	2	"	" Sulph.	2	"
" Ricini	5	"			

